Ministry of Education and Science of Ukraine
Ternopil Ivan Pul'uj National Technical University
(full name of higher education institution)
Faculty of Computer Information Systems and Software Engineering
(faculty name)
Computer Systems and Networks Department
(full name of department)

QUALIFYING PAPER
for diploma project (thesis)

Bachelor
(educational-proficiency level)

topic: Computerized remote voice control system for smart kitchen equipment
Комп'ютеризована система віддаленого голосового керування обладнанням розумної кухні

Submitted by: fourth year student group ICI-42
Specialism (field of study)
123 «Computer Engineering»
(code and name of specialism (field of study))

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Ternopil
2023

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Faculty *Computer Information Systems and Software Engineering*
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APPROVED BY
Head of Department *Halyna Osukhivska*

Assignment

FOR DIPLOMA PROJECT (THESIS) FOR STUDENT

Mlamuli Akim Mthiyane
(surname, name, patronymic)

1. Project (thesis) theme. *Computerized remote voice control system for smart kitchen equipment*

Project (thesis) supervisor Yurii Leshchyshyn, PhD
(surname, name, patronymic, scientific degree, academic rank)

1.Approved by university order as of *20.04.2023 № 4/7-404*
2. Student's project (thesis) submission deadline 13.07.2023
3. Project (thesis) design basis *Technical assignment*

4. Contents of engineering analysis (list of issues to be developed)
Introduction
1. Analysis of the technical task
2. Project part
3. Practical part
4. Life safety, basics of labor protection
Conclusions

5. List of graphic material (with exact number of required drawings, slides)
1. Structural diagram
2. Basic electrical scheme
3. Diagram of electrical connections
4. Block diagram of the program algorithm

6. Advisors of design (thesis) chapters

Chapter	Advisor's surname, initials and position	Signature, date	
		assignment given	assignment accepted
Life Safety			
basics of labor protection			

7. Date the assignment was given *20.04.2023*

PROJECT TIME SCHEDULE

LN	Diploma project (thesis) stages	Project (thesis) stages deadlines	Notes
1	*Development and approval of the technical assignment*	*20.04 – 28.04*	*Done*
2	*Analysis of the technical task and justification of the possible*	*20.04 – 30.05*	*Done*
	solutions		
3	*Development of a structural and functional scheme*	*18.05 – 30.05*	*Done*
4	*Selection of element base*	*18.05 – 30.05*	*Done*
5	*Development of software for the designed*	*18.05 – 30.05*	*Done*
	systems		
6	*Elaboration of the issues of the section "Security*	*20.05 – 25.05*	*Done*
	life activities, basics of labor protection"		
7	*Completion of the explanatory note of the qualification work*	*18.05 – 30.05*	*Done*
8	*Designing the graphic part*	*21.05 – 23.06*	*Done*
9	*Preliminary defense of a bachelor's thesis*	*04.06 – 28.06*	*Done*
10	*Defense of the bachelor's thesis*	*13.07*	*Done*

Student ____________ Mlamuli Akim Mthiyane
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Project (thesis) supervisor ____________ *Yurii Leshchyshyn*
(signature) (surname and initials)

ABSTRACT

Computerized remote voice control system for smart kitchen equipment // Bachelor's work // Mlamuli Akim Mthiyane // Ivan Pulyuy Ternopil National Technical University, Faculty of Computer Information Systems and Software Engineering, Department of Computer Systems and Networks, ICI-42 Group // Ternopil, 2023 // with. -, Fig. -, table. -, chair. -, added. - 3, bibliogr. - 16.

Key words: Smart home kitchen, Arduino, UART.

The bachelor's thesis consists of four sections.

The first section analyzes the terms of reference, and sets out the requirements for a computerized system using voice control in a smart kitchen were concluded.

The second section describes the process of designing and implementing a computerized system voice control in a smart kitchen. How hardware is developed for the system to function.

The third section performs software implementation and testing of a voice control computerized system for controlling the components in a smart kitchen under real operating conditions.

The fourth section describes the issues of safety of livelihood activities and the basics of labor protection, including operation procedure.

CONTENT

INTRODUCTION

In the ever-changing world of technology, smart homes are becoming more and more popular, bringing convenience and efficiency to home owners. Among the various components of a smart home, the kitchen occupies a special place as the heart of the home. To further enhance the smart kitchen experience, we propose to develop a computerized remote voice control system. The computerized smart kitchen remote voice control system is designed to revolutionize the way we interact with kitchen appliances and streamline everyday tasks. Imagine being able to control your oven, refrigerator, coffee maker and other kitchen appliances easily just by using your voice from anywhere in the house. This system harnesses the power of voice recognition, artificial intelligence and internet connectivity to create a seamless and intuitive kitchen environment. With a few voice commands, you can preheat the oven, make a fresh cup of coffee, or check the contents of the fridge without lifting a finger. This system eliminates the need for manual control or physical interaction with the appliances, making cooking and meal preparation more convenient and efficient. The computerized remote voice control system goes beyond the control of individual devices. It integrates various smart kitchen components, allowing synchronization between devices. For example, you can command your smart oven to preheat to a specific temperature while also telling your smart coffee maker to make coffee, all with a single voice command. The system offers a user-friendly interface that allows owners to personalize their dining experience.

Custom voice commands can be configured to suit personal preferences and habits, allowing the system to adapt to your unique needs. Whether you prefer a strong cup of coffee in the morning or a well-cooked steak for dinner, the computerized remote voice control system has your culinary needs covered, this system also promotes safety and saves energy. You can monitor and remotely control energy-consuming devices, ensuring they are turned off when not in use and saving power. Additionally, built-in safety features enable real-time monitoring of potential hazards, such as gas or smoke leaks, triggering automatic shutdowns, and alerts for quick action. In the rapidly changing world of technology, the smart home has become a reality, providing home owners with a variety of innovative solutions to enhance their daily lives. Among the various components of a smart home, the kitchen is an important area where efficiency and convenience are appreciated. To take the smart kitchen concept to the next level, we present a revolutionary solution: a computerized remote voice control system. The computerized smart kitchen remote voice control system is designed to revolutionize the way we interact with and manage our kitchen appliances. Imagine being able to control and monitor your entire kitchen with simple voice commands, from anywhere in your home. The system harnesses cutting-edge technologies such as voice recognition, artificial intelligence, and seamless connectivity to create a truly futuristic and intuitive cooking experience. . The possibilities are endless and the convenience is unparalleled. The computerized remote voice control system integrates seamlessly with all major kitchen appliances, creating a cohesive ecosystem that works seamlessly. This connectivity enables synchronization and automation, allowing devices to work in parallel. For example, you can command your smart dishwasher to start a cycle, all through a simple voice command. This level of coordination and automation streamlines everyday tasks, while saving valuable time and effort. In addition to the ability to control the device, this system is designed to adapt to the unique preferences and habits of each owner.

CHAPTER 1 ANALYSIS OF TECHNICAL TASK

1.1 Analysis of the smart kitchen equipment

Figure 1.1 – Smart Kitchen Equipment.

A computerized remote voice control system for smart kitchen appliances that offers a range of innovative features and benefits that aim to revolutionize the way homeowners interact with their kitchen appliances. Surname. Let's take a detailed look at this modern system:

The system's voice control capabilities provide great convenience, allowing users to operate kitchen appliances with ease. easily with simple voice commands. This eliminates the need for manual input or physical interaction, streamlining everyday tasks and saving valuable time. Users can perform a variety of functions such as adjusting cooking settings, checking inventory or even ordering groceries, all through voice commands, creating an efficient, hands-free cooking experience. .

One of the main strengths of the system is its ability to seamlessly integrate with a wide range of kitchen appliances. This integration enables synchronization and automation between devices, allowing them to work together seamlessly. For example, users can coordinate oven, dishwasher and coffee maker operations through a single voice command, creating a cohesive ecosystem that improves efficiency and simplifies multitasking. in the kitchen.

The system offers a user-friendly interface that allows owners to customize the cooking experience to suit their preferences and habits. Personalized voice commands can be programmed, according to individual needs and habits. This adaptability ensures that the system understands and responds to the specific requirements of each user, improving the overall user experience and making the kitchen environment more personalized and user-centered. heart.

The computerized remote voice control system promotes energy efficiency by providing remote monitoring and control capabilities. Users can proactively manage power consumption by remotely turning off devices when not in use, minimizing power consumption in standby mode and reducing waste. This feature contributes to a greener and more sustainable kitchen environment, in line with the growing emphasis on energy conservation.

The system incorporates advanced security features that contribute to a safe kitchen environment. Real-time monitoring helps detect potential hazards such as gas or smoke leaks, trigger automatic device shutdowns, and send immediate alerts to homeowners. This proactive safety approach ensures swift action can be taken, reducing potential risks and improving overall household safety.

The success of the system depends heavily on the user's experience and usability. Speech recognition technology must be highly accurate and responsive to ensure seamless interaction. In addition, the system interface should be intuitive and user-friendly, allowing users to easily configure and customize their controls. Clear feedback and guidance should be provided to help users maximize the system's capabilities and minimize potential frustration.

As with any smart home technology, security and privacy are important considerations. The computerized remote voice control system should use strong encryption and authentication protocols to protect user data and prevent unauthorized access. Transparent privacy policies and features that give users control over their data should be implemented to build trust and ensure compliance with privacy regulations.

1.2 Analysis of requirements for a computer system for smart kitchen equipment.

Developing an IT system for smart kitchen equipment requires a thorough analysis of the requirements to ensure a successful and efficient implementation. Let's explore the key factors that need to be considered during the analysis:

The computer system must be compatible with a wide range of smart kitchen appliances, including appliances, sensors and other devices. Compatibility ensures seamless integration and interaction between different components, allowing them to effectively communicate and work together. The system must support industry standard protocols and interfaces to ensure compatibility with existing and future smart kitchen appliances.

Robust network infrastructure is essential for smart kitchen appliances. The computer system must support secure and reliable connection options, such as Wi-Fi, Bluetooth, or Zigbee, to enable seamless communication between devices. In addition, the system must be able to connect to the Internet to access online services, perform remote monitoring and control, and allow integration with other smart home systems.

The basic requirement for a computer system in a smart kitchen is accurate and reliable speech recognition. The system must use advanced algorithms and technologies to correctly interpret and understand voice commands. Natural language processing capabilities allow the system to understand and respond appropriately to multiple user instructions, improving the overall user experience.

The computer system should have a user-friendly interface that is intuitive and easy to navigate. The interface must be designed to accommodate different user preferences and provide clear information about the state and response of the system. Usability considerations include the right font size, color scheme, and accessible controls to ensure users can interact with the system easily, even when multitasking in a busy kitchen environment.

A computer system for smart kitchen equipment must allow users to personalize their experience according to their personal preferences and habits. Customization options, such as setting up custom voice commands or adjusting automation settings, allow users to tailor the system to their specific needs. The system must also be adaptive, able to learn and adapt to user behavior over time to provide more accurate and personalized responses.

Due to growing concerns about cyber-security and privacy, strong security measures should be implemented in computer systems. Encryption protocols, secure authentication mechanisms, and secure communication channels must be used to protect user data and prevent unauthorized access. Security features, such as explicit consent mechanisms and data sharing controls, should be integrated to ensure that user privacy is respected.

To promote sustainability and reduce energy consumption, computer systems should include energy efficiency features. It will provide power management options, such as scheduling automatic shutdowns or optimizing energy consumption based on user preferences. The system must also be able to monitor energy consumption and provide information to users on ways to reduce energy waste.

1.3. Analysis of possible solutions to task

When considering possible solutions for the present task, which is to develop a computer system for smart kitchen equipment, several options appear. Let's look at some potential solutions:

One possible solution is to create a standalone computer system specifically designed for smart kitchen appliances. This solution will involve the development of a dedicated hardware and software platform that seamlessly integrates with a variety of devices and sensors. The advantage of a standalone system is that it focuses on the specific needs of the kitchen environment, providing discrete functionality and optimal performance. One potential downside, however, is limited compatibility with other smart home systems and devices outside of the kitchen. Integration with existing smart home systems. Another solution is to integrate the smart kitchen computer system with existing smart home systems. This approach leverages existing infrastructure and connectivity, allowing kitchen appliances to interact with other devices and systems in the home. The benefit of this solution is a comprehensive, interconnected smart home experience where users can control their kitchen appliances along with other automated devices. However, integration challenges and compatibility issues can arise, requiring careful thought and testing.

A cloud-based solution involves using cloud computing and storage to enable remote control, monitoring, and data analysis of smart kitchen equipment. This solution allows seamless access to the system from various devices, regardless of their location. It provides scalability, as cloud resources can be dynamically allocated to meet changing needs. In addition, cloud-based solutions facilitate data analytics and machine learning, enabling automation and personalized recommendations. However, relying on a cloud connection can introduce potential latency and privacy issues.

1.4 Solution Mobile App

Developing a mobile application to control and manage smart kitchen equipment is another potential solution. This solution takes advantage of the widespread use of smartphones and provides users with a convenient and familiar interface to interact with their kitchen appliances. Mobile apps can provide features like remote control, custom settings, recipe suggestions, and inventory management. However, ensuring compatibility with different operating systems and devices, as well as addressing security considerations related to mobile applications, are important challenges to overcome.

Integrating voice-activated assistants, such as Amazon Alexa or Google Assistant, into smart kitchen appliances is a popular solution. These virtual assistants use natural language processing and speech recognition technologies to interpret user commands and control devices accordingly. This solution offers hands-free operation and easy integration with existing voice-activated ecosystems. However, this may require additional hardware integration and compatibility testing, and must address user privacy concerns related to voice data collection.

A hybrid solution that combines multiple approaches to leverage the strengths of different solutions. For example, integrate a standalone system with a cloud connection, or incorporate a voice-activated assistant into a mobile app. This approach allows flexibility and customization, tailoring the system to the specific needs of the user while benefiting from cloud-based resources and broader compatibility.

1.5. Overview of UART Connection as the Main Communication Method between the User and the System:

UART (Universal Asynchronous Transceiver) is a widely used communication protocol for serial communication between devices. As part of connecting users to a computer system for smart kitchen devices, the UART can serve as the primary means of communication. Explore the overview of the UART connection and its relevance in this situation:

UART is a simple, asynchronous, full-duplex communication protocol. It allows data transmission and reception between devices by two communication lines: transmission line (TX) and receive line (RX). UART uses a start bit, a data bit, an optional parity bit, and one or more stop bits to structure the data to be transmitted. It operates at a specific baud rate, which determines the data transfer rate.

UART communication requires specialized hardware, i.e. UART module or UART controller, both on the user interface device (e.g. touch screen, keyboard) and computer system for smart kitchen equipment. These UART modules handle data conversion between parallel and serial formats, ensuring smooth communication between devices.

UART provides a direct and reliable means of interaction between the user and the computer system. The user can enter commands, parameters or instructions through the user interface device, which is then transmitted via UART to the system. Likewise, the system can send feedback, status updates, or feedback to the user via the UART, allowing for seamless two-way communication.

UART communication offers several advantages that make it suitable for user-system interaction in smart kitchens. These benefits include simplicity, low cost, broad device support, and real-time responsiveness. UART is a well-established and standardized protocol that makes it compatible with many different devices and easy to implement in different hardware configurations.

Although UART provides reliable communication, it has some limitations. The maximum transmission distance of the UART is limited, usually several meters, which requires the user interface device to be close to the computer system. In addition, UART operates on a point-to-point connection, which means it supports communication between two devices. Therefore, additional measures or protocols may be required to enable communication between multiple devices in a smart kitchen system.

UART can serve as the base communication method for higher-level protocols that provide additional functionality and features. For example, UART can be used in conjunction with protocols such as I2C (Integrated Circuits) or SPI (Serial Peripheral Interface) to facilitate communication between the user interface device and components or specific sensors in smart kitchen devices.

1.6. Overview of Connection via Ethernet in a Computerized Remote Voice Control System for Smart Kitchen:

In a computerized remote voice control system for smart kitchen appliances, connectivity via Ethernet plays a key role in establishing a reliable, high-speed network infrastructure. Let's provide an overview of how Ethernet connections are used in this context:

Computerized remote voice control system based on network infrastructure to facilitate communication communication between different components. Ethernet is used to connect the various devices involved, such as voice control interfaces, smart kitchen appliances, and central processing units.

An Ethernet switch is used to create a local area network (LAN) in a smart kitchen environment. The switch acts as an intermediary allowing multiple devices to connect and communicate over Ethernet. They provide multiple Ethernet ports to connect various devices, ensuring seamless data transfer.

Ethernet connectivity allows smart kitchen appliances, such as refrigerators, ovens or coffee makers, to be connected to the network. These devices are equipped with a network interface that allows them to communicate with the central processing unit and other devices in the system.

The voice command interface serves as the main point of user interaction in a computerized remote voice command system. This is usually a device, such as a smart speaker or mobile app, that allows users to give voice commands to control smart kitchen appliances. The voice command interface connects to the Ethernet network, allowing it to send and receive commands and data.

The central processing unit, which can be a dedicated server or a cloud-based platform, serves as the brains of the computerized remote voice control system. . It receives voice commands from the voice console, processes them and sends the corresponding instructions to the smart kitchen appliances via Ethernet. The central processor also receives feedback and data from devices, providing real-time feedback and updates to the user.

Ethernet offers several advantages in this context. It provides a reliable and stable connection, ensuring smooth communication between the voice control interface, central processing unit and smart kitchen appliances. The high bandwidth capabilities of Ethernet enable efficient transfer of voice commands, data, and multimedia content within the system. It also enables real-time interaction and feedback, improving the overall user experience.

Ethernet connections can be secured with network security protocols, such as encryption and authentication mechanisms, to protect the system from unauthorized access or data breaches. Additionally, the Ethernet network can easily scale to accommodate additional appliances or devices in a smart kitchen setup, allowing for future expansion or the integration of new technologies.

CHAPTER 2 PRACTICAL PART

2.1 Development of the generalized structure of the computerized system

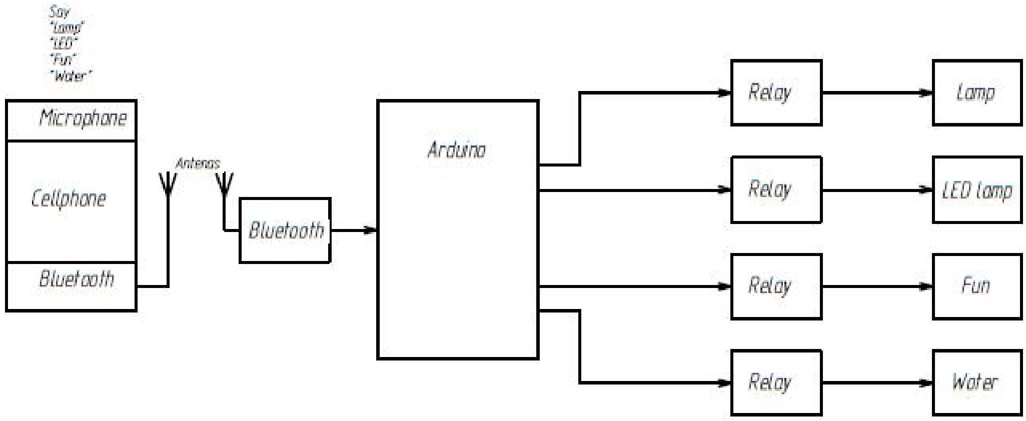

Figure 2.1 – Generalized Structure of the computerized system

The development of a generalized structure of a computerized system involving Bluetooth, Arduino, microphone, relays, lamps (both regular and LED), a fan, and a water sensor can be described as follows:

The Arduino is a microcontroller board that serves as the central processing unit of the system. It provides the computational power and interfaces with various components to control and monitor their operations. The Arduino board is equipped with a microcontroller, which is responsible for executing the program logic and controlling the connected components. It has digital and analog input/output (I/O) pins that allow it to communicate with external devices.

Bluetooth is a wireless communication protocol that enables data transfer between devices over short distances. In the computerized system, Bluetooth can be utilized to establish a connection between the Arduino and other devices like smartphones, tablets, or computers. To incorporate Bluetooth connectivity, you can use a Bluetooth module or shield compatible with Arduino, such as the popular HC-05 or

HC-06 modules. The Bluetooth module can be connected to the Arduino's serial communication pins to establish a wireless link with other Bluetooth-enabled devices.

The microphone is an input device that converts sound waves into electrical signals. It can be integrated into the system to capture audio data for further processing or analysis. To integrate a microphone into the system, you can use an analog microphone sensor module or an electric condenser microphone. The analog output of the microphone is connected to one of the Arduino's analog input pins. The Arduino can then sample the analog signal to capture audio data and perform further processing or analysis.

Relays are electrically operated switches that can control high-power devices using low-power signals. In the computerized system, relays can be employed to switch on/off devices like lamps, fans, or other electrical appliances. Relays are typically used to control high-power devices that cannot be directly controlled by the Arduino's digital pins. For example, if you want to control a lamp or a fan, you can connect the relay module to the Arduino. The Arduino sends a control signal to the relay module, which in turn switches the power supply to the connected device on or off.

Lamps, both regular and LED, can be connected to the system via the relays. The Arduino can control the relays to turn the lamps on or off based on various conditions or user commands. Both regular lamps and LED lamps can be connected to the relays. Regular lamps require an AC power supply, so the relay module is used to switch the mains voltage to the lamp. For LED lamps, which typically operate on DC power, the relay can be used to control the power supply to the LED circuit.

Similar to lamps, the fan can be connected to a relay, which allows the Arduino to control its operation. The fan can be turned on or off depending on temperature conditions, user input, or other factors.

The water sensor is an input device that detects the presence or absence of water. It can be utilized in the system to monitor water levels in a tank, for example. The Arduino can receive input from the water sensor and trigger actions accordingly, such as activating an alarm or turning off a pump. A water sensor can be used to detect the presence or absence of water. Common types of water sensors include float switches or water level sensors. The water sensor is connected to one of the Arduino's digital input pins. The Arduino can read the sensor's state and trigger specific actions based on the water level, such as sounding an alarm or activating a pump to fill or drain a tank.

The program would include instructions for reading data from the microphone or water sensor, processing the data, and sending appropriate signals to control the relays, lamps, and fan. Additionally, the program can incorporate Bluetooth communication protocols to enable remote control and monitoring of the system using external devices such as smartphones or computers. By integrating these components and programming the Arduino accordingly, you can create a computerized system that responds to various inputs and controls the connected devices based on specific conditions or user commands.

2.1.1 Description of the electrical circuit schematic

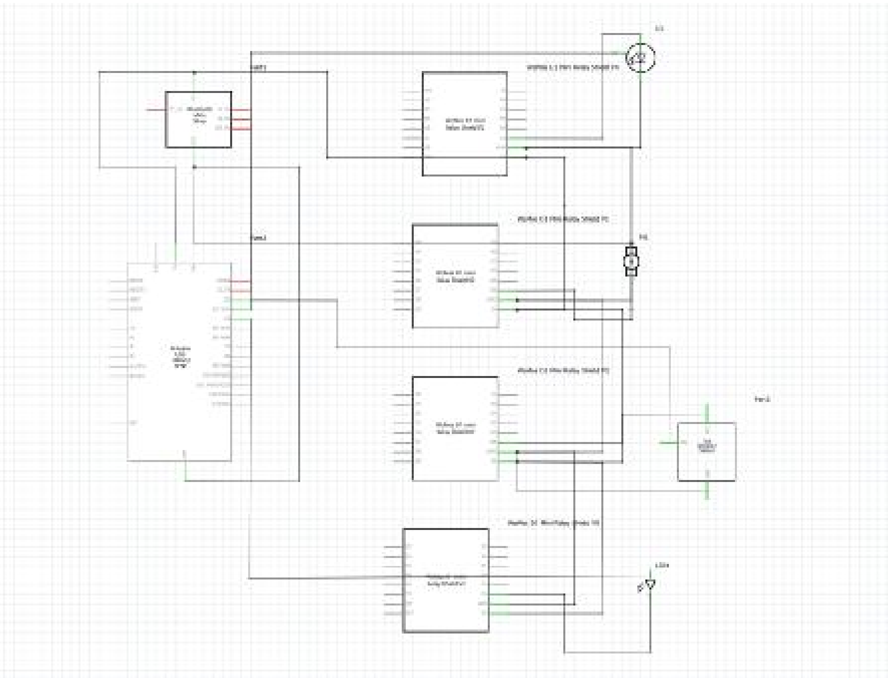

Figure 2.2 – Description of the electrical connection schematic

Below is the explanation of the electrical connection schematic for the generalized structure of the computerized system involving Bluetooth, Arduino, microphone, relays, lamps, LED lamp, fan, and water sensor:

Connect the Arduino's 5V pin and GND pin to a stable power source.

Connect the Bluetooth module to the Arduino's digital pins for serial communication (typically RX and TX pins).

Connect the analog output of the microphone to one of the Arduino's analog input pins

Connect the water sensor to one of the Arduino's digital input pins.

Connect the relay module's VCC and GND pins to the Arduino's 5V and GND pins, respectively.

Connect the relay module's control pins to separate Arduino digital output pins

Connect one end of the lamp to the relay module's common (COM) pin and the other end to the relay's normally open (NO) pin.

Connect the LED lamp to a separate relay in the same manner as the regular lamp.

Connect the fan to another relay in the same way as the lamps.

Ensure the Bluetooth module has its own power supply

Connect the Arduino's TX pin to the Bluetooth module's RX pin and the Arduino's RX pin to the Bluetooth module's TX pin.

To avoid damaging the Bluetooth module, you may need to use a voltage divider circuit to step down the Arduino's TX signal voltage to the Bluetooth module's acceptable voltage level.

Connect the power supply for the lamps and fan to the relay module's power input, ensuring the power supply is suitable for the respective devices (AC or DC).

Depending on the specific water sensor, it may require a separate power supply connection or be powered directly by the Arduino.

Ensure you follow the appropriate voltage and current specifications for all components, and double-check the pin configurations and connections in the component data sheets or user manuals.

2.1.2. Description of connection schematic.

During the development of a computerized remote voice control system for smart kitchens, it was necessary to design a general structure of the computer system. This structure serves as the basis for the system's functionality and facilitates effective communication and coordination between the different components of the system. Below is an overview of the general structure of the computer system in the computerized remote voice control system for smart cookers:

Voice control interface Voice is part of a user-facing system that allows the user to interact with the smart kitchen appliance using voice commands. It could be a dedicated device, such as a smart speaker or a mobile app, that captures and processes voice input from the user.

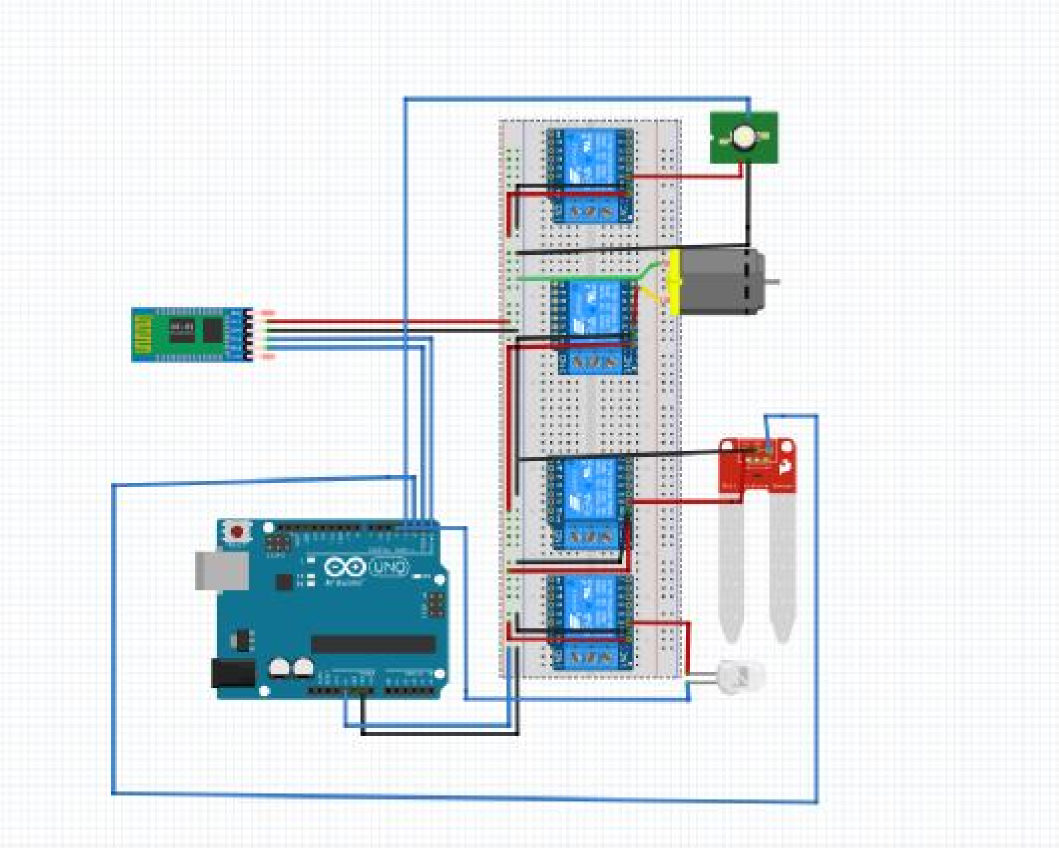

Figure 2.3 – Connection schematic.

Speech recognition and processing module is responsible for interpreting voice commands received from the voice command interface. It uses advanced algorithms and techniques, such as automatic speech recognition (ASR) and natural language processing (NLP), to convert speech into easy-to-understand instructions for the system.

The central processing unit (CPU) serves as the heart of a computer system, processing and coordinating tasks. It receives interpreted voice commands from the voice recognition and processing module, and generates corresponding instructions for the smart kitchen appliance.

The Ethernet connection serves as the primary means of communication between the various system components. It allows the voice command interface, speech recognition and processing module, and the central processor to transparently exchange data and instructions. Switches and Ethernet cables facilitate the connection between these components, forming a local area network (LAN) in a smart kitchen environment.

Smart kitchen equipment such as refrigerators, ovens, coffee makers and other devices is an integral part of the system. These devices are equipped with a communication interface that allows them to receive instructions from the central device and provide real-time feedback on their status and operation.

A computer system may include a database or storage component to store data and related information. This can include user preferences, recipes, inventory data, and historical usage patterns. The database enables efficient information retrieval and supports a personalized user experience.

The User Interface Component provides a visual representation of the system's status, responses, and commands. It can be done through a display, mobile app or web interface, allowing users to remotely monitor and manage smart kitchen appliances.
To ensure system security and protect user data, appropriate security measures must be taken. This may include user authentication mechanisms, data encryption, and secure communication protocols to protect sensitive information.

A computerized remote voice control system that can be integrated with external services or platforms. For example, it can connect to online recipe databases, grocery delivery services, or home automation systems, enhancing system functionality and providing a seamless user experience.

The development of the generalized structure of the computer system in a computerized remote voice control system for a smart kitchen is a crucial step in designing an efficient and user-friendly solution. It establishes the framework for communication, processing, and coordination among the system's components, ensuring seamless operation and integration within the smart kitchen environment.

2.2. Justification of the Choice of Hardware in a Computerized Remote Voice Control System for Smart Kitchen:

2.2.1. Relay module (WeMos d1 mini relay shield)

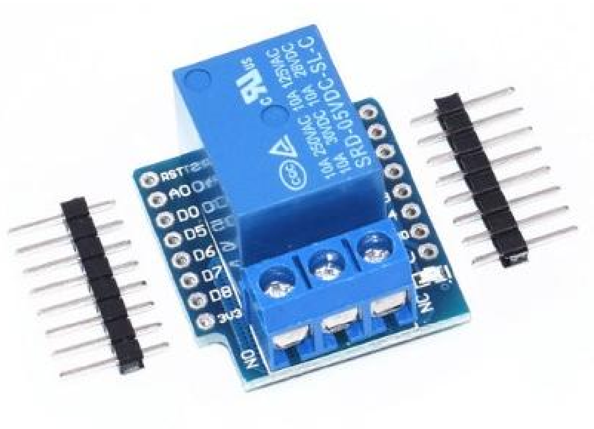

Figure 2.4 - Relay module(WeMos d1 mini relay shield)

The WeMos D1 Mini Relay Shield is an expansion board specially designed for the WeMos D1 Mini development board. It incorporates a relay module, allowing to control high power devices or circuits using the WeMos D1 Mini micro controller. Here is some information about the WeMos D1 Mini Relay Shield:

The WeMos D1 Mini Relay Shield is used to provide relay functionality to the WeMos D1 Mini board. A relay is an electrically operated switch that uses an electromagnet to mechanically open or close a set of contacts. The relay shield allows the WeMos D1 Mini to control external devices or circuits that require a higher voltage, current or power supply.

The WeMos D1 Mini Relay Shield is a compact module that plugs directly into the WeMos D1 Mini development board, forming a stackable configuration. It has a high quality relay with single pole double throw (SPDT) configuration, which means it can control both normally open (NO) and normally closed (NC) contacts. The Shield also includes an indicator LED to provide visual feedback on relay status. It is designed to be compatible with the Arduino programming environment, allowing users to easily program and control the relay using familiar Arduino functions and libraries.

The WeMos D1 Mini Relay Shield supports a wide range of voltages and currents for switching external devices or circuits. The relay is capable of handling AC voltage up to 250V and DC voltage up to 30V, with a maximum current rating of 10A. This makes it suitable for controlling various high power devices, such as lights, fans, motors, solenoid coils and other electrical appliances.

The WeMos D1 Mini Relay Shield finds applications in home automation, robotics, industrial control and other projects that require control of high power devices. Some common use cases include:

Relay shields can be used to control lights, home appliances or other electrical appliances in a smart home setup. By integrating the WeMos D1 Mini with other sensors or input devices, users can automate device control based on specific conditions or triggers.

Relay shields can be used in industrial applications to control machines, equipment or processes that require high power switching. It provides a reliable and efficient way to control industrial equipment using the WeMos D1 Mini micro controller.

Relay shields can be used in robotics projects to control motors, actuators or other power-hungry components. It allows precise control of the movements or actions of robotic systems.

The WeMos D1 Mini Relay Shield can be programmed and controlled using the Arduino programming environment. By using appropriate libraries and functions, users can easily integrate relay control into their projects. The shield can be connected to the WeMos D1 Mini via standard GPIO pins, and the relay can be controlled by switching the corresponding digital output pin.

When using the WeMos D1 Mini Earth Shield, it is important to observe the appropriate safety precautions, especially when dealing with high voltages and currents. Make sure that external devices or control circuits meet the specifications of the relay. Be careful to avoid short circuit or wrong wiring which can cause damage or danger.

Basically, the WeMos D1 Mini Relay Shield is an expansion board designed to provide relay functionality for the WeMos D1 Mini microcontroller. It allows the control of high power devices or circuits, making it suitable for a wide variety of applications in home automation, robotics and industrial control. Understanding its features, electrical specifications, and programmability enables users to efficiently integrate relay control into their projects.

2.2.2. Arduino UNO

Figure 2.5 -Arduino UNO

Arduino Uno is a popular microcontroller board widely used in electronics and prototyping. It is part of the Arduino development board family and provides a user-friendly platform for creating interactive electronic projects. Here is some information about the Arduino Uno:

The Arduino Uno is based on the ATmega328P microcontroller, which is an 8-bit AVR (enhanced virtual RISC) microcontroller. It operates at a clock speed of 16 MHz and has 32 KB of flash memory for program storage, 2 KB of SRAM for data storage, and 1 KB of EEPROM for permanent storage.

The Arduino Uno has a total of 14 digital input/output pins, 6 of which can be used as pulse width modulation (PWM) outputs. These pins can be used to communicate with various electronic components, such as sensors, actuators, displays, and others. In addition, the board also has 6 analog input pins to read the value from the analog sensor.

The Arduino Uno includes a built-in USB interface, allowing easy connection to a computer for programming and communication. It uses a USB-to-serial converter chip, allowing serial communication between the board and the computer.

The Arduino Uno can be powered via a USB connection from a computer or through an external power source. It supports a wide input voltage range of 7-20V, although 6-12V is generally recommended. The board has a built-in voltage regulator that provides a stable 5V supply to power the microcontroller and other components.

The Arduino Uno is programmed using the Arduino Software (IDE), a user-friendly development environment that simplifies the process of writing, compiling, and uploading code to the board. The Arduino programming language is based on Wires, which is a simplified version of C/C++.

One of the main advantages of the Arduino Uno is its compatibility with a variety of expansion boards known as "shields". The shields can be easily stacked on the Arduino Uno, providing additional features and functionality such as wireless communication, motor control, Ethernet connectivity, and more. This modularity makes it easy to extend the capabilities of the Arduino Uno to specific project needs.

Arduino Uno has a large and active community of users, manufacturers, and developers. The Arduino website provides comprehensive documentation, tutorials, and examples to help beginners and experienced users expand their knowledge. The open source nature of Arduino also encourages sharing of projects and code, fostering a collaborative environment.

The Arduino Uno is very versatile and can be used in many applications including:

Controlling motors, sensors and actuators in robotics projects.

Build a smart home system to control lights, home appliances and security systems.

Teach electronics and programming concepts in the classroom and in the workshop.

Rapid prototyping and development of electronic projects and inventions.

Generally, the Arduino Uno is a powerful and versatile microcontroller board that is suitable for many electronic projects. Its ease of use, scalability through shields, and active community support make it a popular choice for hobbyists, students, and professionals.

2.2.3. HC-05 Bluetooth Module

The HC-05 Bluetooth module is a widely used and affordable Bluetooth communication module that enables wireless communication between devices. It is commonly used in various electronic projects and applications that require wireless connectivity. Here is some information about Bluetooth module HC-05:

Figure 2.6 – Bluetooth Module

The HC-05 module uses Bluetooth technology, specifically Bluetooth version 2.0 + EDR (Data Rate). advanced). Bluetooth is a wireless communication technology that allows devices to exchange data over short distances using radio waves. It provides a convenient and reliable method for connecting devices such as smartphones, tablets, computers and microcontrollers.

The HC-05 Bluetooth module provides the following features and specifications:

The module communicates with a host device using a serial interface, commonly known as a UART (Asynchronous Receiver/Synchronous Transfer).

The HC-05 module is a Class 2 Bluetooth device, meaning it has a range of about 10 meters (33 feet) under normal conditions.

The module normally operates at 3.3V, making it compatible with a wide range of micro controllers and devices.

The default baud rate of the HC-05 module is 9600 bps, but it can be configured to different baud rates using AT commands.

The HC-05 module can operate in master and slave modes. In slave mode, it can be paired with a Bluetooth enabled device such as a smartphone or computer. In master mode, it can initiate connection with other Bluetooth devices.

The module supports basic security functions such as authentication and encryption to ensure secure communication between devices.

The HC-05 module typically has six pins that must be connected to the host device:

- VCC: power pin (3.3 V).
- GND: grounding.
- TXD: Data transfer pin for serial communication.
- RXD: receive data pins for serial communication.

- STATUS: Status indicator pin, which can be used to check the status of a module (e.g. paired, connected).
- KEY/EN: Activation key or code, used to enter AT command mode or switch between master and slave mode.

The HC-05 module supports the AT command set, allowing you to configure various parameters and behavior of the module. By sending specific AT commands through the serial interface, you can change settings such as baud rate, device name, pairing mode, etc.

The HC-05 Bluetooth module can be used in many applications, including:

Wireless communication

establish wireless communication between micro controllers, sensors and Other devices.

IoT (Internet of Things)

Enables Bluetooth connectivity for IoT devices, allowing them to communicate with smartphones or other Bluetooth enabled devices.

Home Automation

Control and monitor your home automation system using your smartphone or computer.

Enables wireless control and communication between robots or robotic components.

Creates wearable devices that communicate wirelessly with other devices.

To use the HC-05 module in a project, you will need to write code to interface with it.

Many microcontroller platforms, such as Arduino, provide libraries and sample code that simplify the process of using the HC-05 module.

These libraries handle serial communication and AT command handling, making it easy to integrate Bluetooth functionality into your project.

2.3. Justification of the Choice of Software in a Computerized Remote Voice Control System for Smart Kitchen:

In a computerized remote voice control system for smart kitchens, the choice of software is essential to ensure efficient and reliable operation, seamless integration of components and a great experience. user-friendly experience. This is the reason for choosing software in a computer tool designed for a computerized remote voice control system for smart kitchens:

Part Software used for speech recognition and processing must have powerful algorithms and techniques for accurate speech-to-text conversion and natural language processing. Advanced Automatic Speech Recognition (ASR) software, combined with Natural Language Understanding (NLU) and Natural Language Generation (NLG) capabilities, enables accurate interpretation of voice commands and responses meaningful.

To ensure seamless integration and communication between the various components of a smart kitchen system, protocols and software frameworks play an important role. Choosing software that supports standard communication protocols, such as TCP/IP, MQTT, or RESTful APIs, enables easy interoperability and data exchange between hardware devices and software modules. different soft.

The software responsible for central processing and control must provide effective task management, decision-making, and coordination of system operations. This includes software components such as control algorithms, event-based programming, and real-time processing to enable fast response times and smooth operation of smart kitchen appliances.

To store and manage data related to user preferences, recipes, inventory, and historical usage patterns, base software Reliable and scalable databases are essential. This includes choosing database management systems (DBMS) such as MySQL, MongoDB, or PostgreSQL that can handle efficient data storage, retrieval, and querying in a secure and reliable manner. trust.

The software used for the user interface must provide an intuitive and user-friendly experience. This can be achieved through a Graphical User Interface (GUI), a mobile application or a web interface that allows the user to interact with the system easily. Software must have well-designed user experience (UX) principles, including clear visual feedback, easy navigation, and personalized features.

To ensure system security and protect user data, the choice of software must include strong security measures. This includes encryption algorithms, secure communication protocols (e.g. SSL/TLS), and authentication mechanisms (e.g.

username/password, biometric) to prevent unauthorized access authorization, protect sensitive information and ensure data integrity.

With future growth and the potential for system expansion, it is important to choose software that is scalable and flexible. This includes choosing frameworks and software architectures that can support additional peripherals, handle growing data processing needs, and integrate with emerging technologies or standards. .

The availability of software development tools, libraries, and a supportive community is essential to successful implementation and maintenance of voice control systems from remote on the computer. Choosing software with an active developer community, comprehensive documentation, and regular updates ensures ongoing support, bug fixes, and access to new features.

The choice of software in a computerized remote voice control system for a smart kitchen should align with the specific requirements of the system, including voice recognition, system integration, central processing and control, database management, user interface, security, scalability, and software development support. Selecting the appropriate software components ensures a robust, efficient, and user-friendly system that enhances the smart kitchen experience.

2.4 Computer system flowchart for smart kitchen equipment

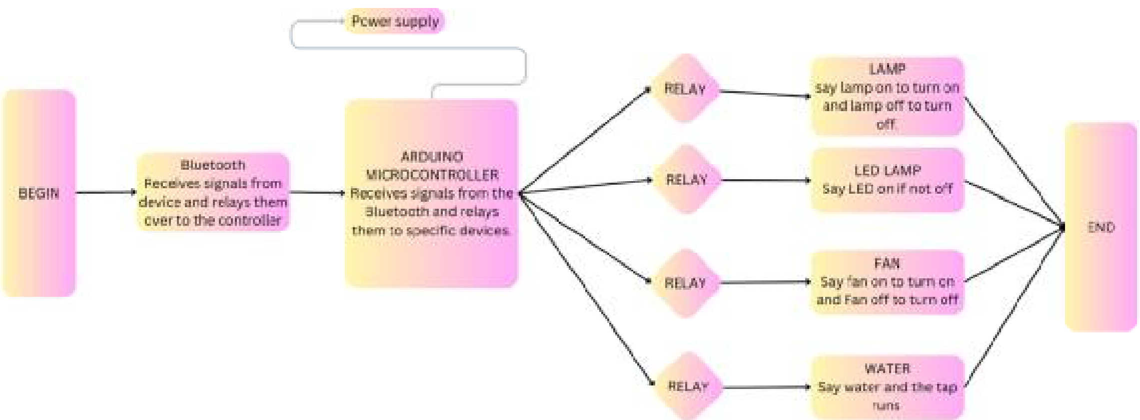

Figure 2.7. – Flowchat

In a computerized remote voice control system for smart kitchens, the flowchart of the computer system depicts the logical sequence of operations and interactions between the different components. Here is a suggested diagram for the computer system in a computerized remote voice control system for smart kitchen equipment:

The system initializes and starts listening to the wake word. or wake-up phrase. The system listens for the specified wake word or wake phrase to activate the voice command function.

After detecting the wake word, the system waits for the user's voice command or query.

User voice commands are processed by speech recognition software to convert speech into text.

The system interprets user commands using natural language processing techniques to determine user intent.

Based on the interpreted command, the system performs the corresponding operations. This may include tasks such as researching recipes, controlling equipment, managing inventory, or providing cooking instructions.

The system generates appropriate feedback, which can be in the form of voice instructions, on-screen visual feedback, or a combination of both. Feedback can include recipe suggestions, cooking instructions, confirmation of actions taken, or error messages if the command is not recognized or there is a problem executing.

The system updates the internal state based on the command executed. For example, it can update inventory after adding or removing items, adjust your appliance's cooking settings, or change timers and alarms.

After responding and updating the system status, the system switches back to listening mode to wait for the next user command.

If the user gives a command to deactivate the voice command system, the system will stop listening to other commands and go into standby mode.

The system terminates. It is important to note that the diagrams provided are general representations and can be expanded or modified to fit the specific features and requirements of a computerized remote voice control system. for smart kitchen equipment. In addition, error handling and exceptions must be reviewed to ensure proper handling of unexpected situations or invalid commands.

CHAPTER 3 PRACTICAL PART

3.1 Implementation of project

The connection between Bluetooth and the Arduino includes establishing a serial communication link. Here is the explanation of the connection:

Connect the TX (transmit) pin of the Bluetooth module to the RX (receive) pin of the Arduino. Connect the RX (receive) pin of the Bluetooth module to the TX (transmit) pin of the Arduino. Be sure to provide a common connection when connecting the GND pins of the Bluetooth module and the Arduino.

To enable communication between the Arduino and the Bluetooth module, you must use the software serial library. The most commonly used library is "SoftwareSerial". - Include the SoftwareSerial library at the top of your Arduino code: `#include `. - Creates a SoftwareSerial object, specifying the RX and TX pins connected to the Bluetooth module: `SoftwareSerial bluetooth(RX_PIN, TX_PIN);`. Replace `RX_PIN` and `TX_PIN` with the corresponding pin number on the Arduino board.

In the `setup()` function, initialize the baud rate for the communication: `bluetooth.begin(9600);`. The baud rate should match your Bluetooth module settings. - Wait for the Bluetooth module to launch by adding a delay: `delay(1000);` (1 second is usually enough).

To send data from the Arduino to the Bluetooth module, use the `bluetooth.print()` or `bluetooth.println()` functions. - To receive data from the Bluetooth module to the Arduino, use the `bluetooth.available()` and `bluetooth.read()` functions. To read a character sent by the Bluetooth module:

```
```cpp
  if (bluetooth.available()) {
     char receivedData = bluetooth.read();
     // Process the received data as needed
  }
```
```

Remember to connect the Bluetooth module to the appropriate voltage levels and check the documentation for your specific Bluetooth module for any additional requirements or configuration steps. Also, make sure the baud rate settings are consistent between the Arduino code and the Bluetooth module configuration. By establishing the right hardware and software connections, you can enable serial communication between the Bluetooth module and the Arduino, making it easier to exchange data between the two devices.

3.2 The connection between the Arduino and the relays.

Connect the control pin of the Relay Module to the digital pin of the Arduino. The number of control pins depends on the number of relays on the module. For example, if you had a relay module with two relays, you would connect the two control pins to two separate digital pins on the Arduino. Also connect the VCC pin of the relay module to the 5V pin of the Arduino and the GND pin to the GND pin of the Arduino.

```cpp
// Define the relay control pin
#define RELAY_PIN 2

void setup() {
  // Initialize the relay pin as an output
  pinMode(RELAY_PIN, OUTPUT);
}

void loop() {
  // Turn on the relay
  digitalWrite(RELAY_PIN, HIGH);
  delay(2000); // Wait for 2 seconds

  // Turn off the relay
  digitalWrite(RELAY_PIN, LOW);
  delay(2000); // Wait for 2 seconds
}
```

In this sample code, we define the relay control pin as `RELAY_PIN`, which is connected to digital pin 2 of the Arduino.

In the `setup()` function, we set `RELAY_PIN` as an output using `pinMode(RELAY_PIN, OUTPUT)` to indicate that we want to control the relay connected to this pin. In the `loop()` function, we show the basic on/off control of the relay. We enable the relay by setting `RELAY_PIN` to `HIGH` using `digitalWrite(RELAY_PIN, HIGH)`.

Then we wait 2 seconds using `delay(2000)`. We then turn off the relay by setting `RELAY_PIN` to `LOW` using `digitalWrite(RELAY_PIN, LOW)`.

We wait 2 seconds again using `delay(2000)`. This loop repeats indefinitely. You can modify this code to your specific needs. For example, you can add external conditions or triggers to control a relay based on sensor readings, user input, or any other desired logic. Be sure to double check the latch connections of the relay module, as they may vary depending on the specific module you are using.

3.3. Connection from relays to the devices.

Connect the control pins of the relay module (IN1, IN2, etc.) to the separate digital pins of the Arduino. The number of control pins will depend on the number of relays on the module.

Also, connect the VCC and GND pins of the relay module to the 5V and GND pins of the Arduino respectively. - Fan: Connect a fan to one of the output pins of the relay module (e.g. OUT1). One wire from the fan must be connected to the common (COM) pin of the relay, and the other must be connected to the normally open (NO) pin.

Connect the lamp to another output pin of the relay module (e.g. OUT2) in the same manner as the fan.

Connect the LED to the output pin of a separate relay module, similar to a lamp.

Connect the water sensor to the digital input pin on the Arduino. Make sure the GND pin of the water sensor is connected to the GND pin of the Arduino.

This is a short code that demonstrates controlling fans, lights, LEDs and water sensors with a relay:

```cpp
// Define the relay control pins
#define FAN_RELAY_PIN 2
#define LAMP_RELAY_PIN 3
#define LED_RELAY_PIN 4

// Define the water sensor input pin
#define WATER_SENSOR_PIN 5

void setup() {
  // Initialize the relay control pins as outputs
  pinMode(FAN_RELAY_PIN, OUTPUT);
  pinMode(LAMP_RELAY_PIN, OUTPUT);
  pinMode(LED_RELAY_PIN, OUTPUT);

  // Initialize the water sensor pin as an input
  pinMode(WATER_SENSOR_PIN, INPUT);
}

void loop() {
  // Read the water sensor state
  int waterSensorState = digitalRead(WATER_SENSOR_PIN);

  // Control the fan based on the water sensor state
  if (waterSensorState == HIGH) {
    digitalWrite(FAN_RELAY_PIN, HIGH);  // Turn on the fan
  } else {
    digitalWrite(FAN_RELAY_PIN, LOW);   // Turn off the fan
  }

  // Control the lamp
  digitalWrite(LAMP_RELAY_PIN, HIGH);   // Turn on the lamp

  // Control the LED lamp
  digitalWrite(LED_RELAY_PIN, LOW);     // Turn off the LED lamp
}
```

In this short code, we define the relay control pins for the fan, light and LED as `FAN_RELAY_PIN`, `LAMP_RELAY_PIN` and `LED_RELAY_PIN` respectively. We also define the water sensor pin as "WATER_SENSOR_PIN". In the `setup()`

function, we define the relay control pins and the water sensor pins as output and input respectively, using `pinMode()`.

In the `loop()` function, we read the state of the water sensor using `digitalRead(WATER_SENSOR_PIN)` and store it in the variable `waterSensorState`.

Depending on the status of the water sensor, we control the fan by setting `FAN_RELAY_PIN` to `HIGH` or `LOW` using `digitalWrite()`.

If the water sensor status is HIGH, the fan will turn on; otherwise it will turn off. We also control the lights and LEDs by setting the respective relay control pins to "HIGH" or "LOW" using "digitalWrite()".

The light is on and the LED is off. You can modify this code to your specific needs. For example, you can include additional conditions or triggers to control the device based on sensor readings or user input. Be sure to double-check the relay module pin connections and adjust the relay control pin assignment accordingly based on your specific hardware configuration.

3.4. System Testing.

System testing for smart kitchens includes testing the functionality and performance of various components as well as their integration in the system. Here is a general overview of the test procedure: Test each part individually to make sure it is working properly. This includes the Arduino, the Bluetooth module, the relay, the lights, the LEDs, the fan, the microphone, and the water sensor. For example, test the

Bluetooth module by connecting it to a computer or smartphone and check if it can establish a connection and transmit/receive data successfully.

Similarly, test the relays by manually activating them and confirming that the connected devices (e.g. lights, fans) turn on/off as expected. Connect components together according to the system design, following the appropriate electrical connections and integrating the code.

Check the communication between the Arduino and the Bluetooth module. Send commands from a Bluetooth enabled device to the Arduino and make sure that the corresponding actions are taken, such as controlling lights, fans, or other devices. Check the interaction between the Arduino and other components, such as the microphone and the water sensor. Verify that the Arduino can receive data from these input devices and trigger the appropriate actions or responses.

Test the basic functions of the smart kitchen system. This could include situations like turning lights or fans on/off based on sensor readings, controlling devices remotely via Bluetooth, or triggering specific actions based on voice commands picked up by the microphone. Evaluate system performance under various conditions, such as heavy loads or prolonged operation.

Monitor system reliability by running the system continuously for an extended period of time and checking for any unexpected behavior, problems, or errors. Involve end users or stakeholders in the testing process to gather feedback and assess overall system usability, functionality, and satisfaction.

Synthesize user feedback to make necessary improvements or adjustments to perfect the smart kitchen system. Be sure to document any issues, bugs, or improvements identified during testing. Regularly review and refine the system based on feedback and test results to ensure optimal performance and user experience.

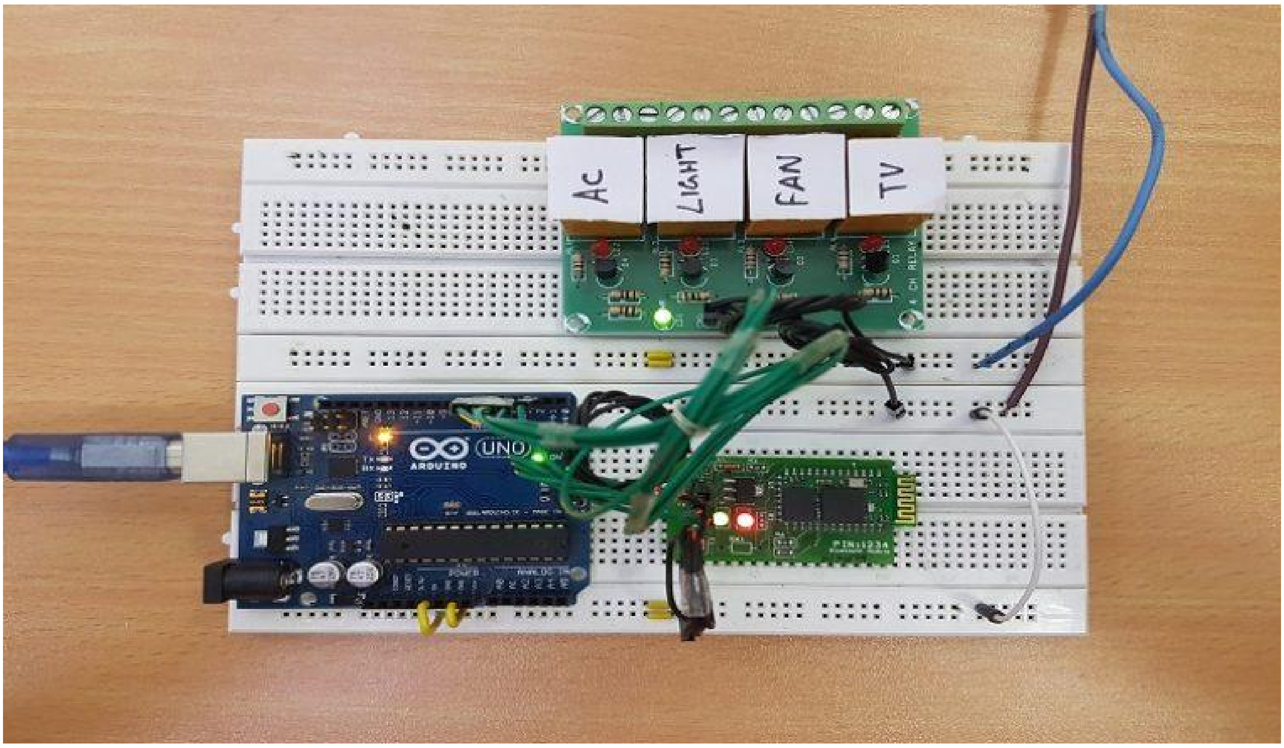

Figure 3.1. – Visualization of hardware system testing.

User acceptance testing ensures that the system meets user expectations, meets user needs, and provides desired functionality. By performing rigorous testing at every stage of the development process, the Smart Kitchen Computerized Remote Voice Control System can be carefully evaluated, fine-tuned and validated. Testing helps identify and resolve any issues, ensuring a robust and reliable system that delivers an intuitive and efficient voice-controlled experience in a smart kitchen environment.

CHAPTER 4 SAFETY OF LIVELIHOOD ACTIVITIES, BASIS OF LABOR PROTECTION

4.1. Medical care for bleeding

Medical care for bleeding is an important aspect that must be considered in the design of a computerized remote voice control system for the Smart Kitchen. While the system is primarily focused on kitchen automation and voice control, it is essential to include safety measures and offer advice in the event of an emergency such as bleeding. Here are some considerations when providing medical care in the event of bleeding in the system:

Includes a comprehensive database of first aid information in the system software. This database will include different types of bleeding, including minor cuts, deep wounds, and arterial bleeding. Provides step-by-step instructions on how to assess the severity of bleeding, control it, and administer appropriate first aid measures. Information should be easily accessible through voice commands or a user-friendly interface.

System design provides voice prompts to administer first aid in case of bleeding. When a user reports a bleeding incident or asks for help, the system responds with clear and concise instructions on how to respond to the situation. Voice prompts will guide the user through the necessary steps to control bleeding, such as applying direct pressure, elevating the affected area, or applying a tourniquet if necessary.

Integrate emergency coordinates into the system. Give users voice commands or a dedicated interface to access emergency numbers, such as local health services or an emergency helpline. This allows users to quickly call for professional medical assistance if bleeding is severe or beyond their control.

Implement automated alerts in the system to detect and notify users of potential bleeding emergencies. For example, the system could monitor sensors or smart devices in a kitchen environment to detect falls, accidents or injuries that could lead to bleeding. When such incidents are detected, the system can immediately alert the user and provide instructions on how to handle bleeding until medical help arrives.

Includes educational resources in the system to provide users with basic bleeding first aid training. Provide interactive video tutorials, diagrams or tutorials that users can access to enhance their knowledge and preparation. This allows the user to respond effectively to bleeding incidents and potentially minimizes further damage.

Incorporate safety features into the design of kitchen appliances and appliances to reduce the risk of injury that could lead to bleeding. This can include features like automatic shut-off mechanisms, safety blade designs, and sensor-based technology that help prevent accidents and reduce the chance of a cut or injury. It is important to note that while the computerized Smart Kitchen's remote voice control system can offer advice and assistance in the management of bleeding incidents, it should not replace professional medical care. In the event of severe bleeding or life-threatening situations, users should be encouraged to seek immediate medical attention from qualified healthcare professionals.

4.2 Aesthetic design of the PC operator's workplace.

The aesthetic design of the PC Operator Workstation in the Computerized Remote Voice Control System for Smart Kitchens plays an important role in improving the user experience, creating a attractive and visually appealing environments, while promoting efficiency and productivity. Here are some considerations for the aesthetic design of a PC operator's workstation:

Prioritize ergonomic design principles to ensure operator comfort and safety operating PC. Choose a chair and desk with the right support to maintain healthy posture over long periods of use. Consider adjustable features such as height-adjustable desks and chairs, adjustable monitor stands, and ergonomic keyboard and mouse configurations for optimal comfort and reduced risk fatigue or injury.

Design a PC operator's workstation with a functional layout that optimizes workflow and efficiency. Organize your office space for easy access to your PC, keyboard, mouse, and other essential tools or equipment. Make sure cables and cords are neatly organized and out of the way to minimize clutter and potential hazards.

Pay attention to lighting design to create a well-lit and comfortable workspace.

Combines a combination of natural and artificial light to provide enough light without causing glare or eye strain. Consider adjustable lighting options to suit different asks and preferences. Additionally, incorporating task lighting that focuses on the PC keyboard area can improve visibility and reduce eye strain.

Choose a visually appealing color palette that complements the overall design aesthetic of the computerized remote voice control system and smart kitchen environment. Consider colors that evoke feelings of calm, focus, and focus. Also, make sure that the contrast between components is sufficient to improve the readability and usability of the PC interface.

Incorporate complete storage solutions to keep operator workspaces neat and orderly. Provide drawers, shelves, or storage compartments to keep documents, manuals, and other essentials within reach. Incorporate branding and visual identity elements into the design of a PC operator's workstation. Use system logos or specific design elements to create a consistent and recognizable visual identity. This enhances the connection between the operator and the computerized remote voice control system, promoting a sense of belonging and familiarity.

Allows the personalization of the PC operator's workstation to create a sense of belonging and comfort. Making space for personal items, such as photos or small ornaments, allows operators to customize their workspace according to reason. This can contribute to a positive and engaging work environment.

Consider incorporating features to reduce noise distractions in the PC operator's workplace. Use sound-absorbing materials, such as acoustic panels or carpets, to reduce ambient noise levels. This helps create a quieter and more focused work environment, allowing operators to focus on their tasks without unnecessary interruptions. By considering these aspects, the aesthetic design of the PC operator's workplace in a Computerized Remote Voice Control System for Smart Kitchen can enhance the overall user experience, promote productivity, and create a visually pleasing and functional workspace.

CONCLUSION

Computerized smart kitchens that combine components such as fans, LEDs, water sensors and LEDs provide an efficient and transformative way to manage different aspects of kitchen functionality. Using advanced technology and automation, these components not only respond quickly to user commands, but also intelligently adapt to ensure a seamless experience. The system's ability to handle situations without components adds another layer of convenience and adaptability. In a computerized smart kitchen, fans play an important role in maintaining proper airflow and ventilation. Through voice commands or automatic settings, users can control fan speed and direction to create a comfortable environment for cooking or manage heat and odors. For example, the user can simply say "Increase fan speed" or "Set fan to rotate clockwise".

The system's fan component responds quickly to these commands, adjusting its settings accordingly to meet user requirements. Likewise, LED lights are an integral part of a smart kitchen installation. It offers customizable lighting options to create the desired mood and optimize visibility in different areas of the kitchen. Using voice commands, users can adjust brightness levels, change colors, or even set specific lighting scenes. For example, the user might say: "Decrease the LED's brightness by 50%" or "Set the LED to warm white". The system's LED component quickly recognizes and executes these commands, instantly changing its illuminance to match the user's preferences. The water sensor is another essential component of a computerized smart kitchen that provides real-time information on water levels and detects potential leaks.

When integrated into the system, the water sensor provides proactive monitoring and alerts the user in the event of anomalies. For example, if the sensor detects a high water level or a leak, it can send an immediate notification to the user's smartphone or smart screen, allowing them to act quickly. By saying "Check water sensor status" or "Notify me of water leaks", users can be informed and quickly resolve any potential problems. This response not only informs the user of the limitation, but also provides guidance on the components available in the system. By making it clear which devices the system can control, it helps users navigate features efficiently. In addition, the system can also offer suggestions or alternatives, such as recommending other compatible devices or providing instructions on how to manually operate a non-integrated component.

This adaptability demonstrates system intelligence and user-centric design, ensuring a seamless user experience even in situations where a specific component is not present. A computerized smart kitchen with components such as fans, LEDs, water sensors and LEDs provides the most advanced solution to streamline and improve kitchen functionality. These components respond quickly and intelligently to voice commands, allowing users to easily control ventilation, lighting and water monitoring systems. The system's adaptability in management situations where there are no components adds convenience and flexibility to the user experience. Thanks to advanced technologies and automation, computerized smart kitchens are changing the way we interact with kitchen appliances, paving the way for a more enjoyable and productive dining experience. As technology continues to advance, we can expect even more exciting possibilities in the field of smart kitchens and home automation.

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Appendix A: Technical Task

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
Ternopil Ivan Puluj National Technical University
Faculty of Computer Information Systems and Software Engineering

Computer Systems and Networks Department

"Approved"
Head of department
________ Osukhivska H.M.
"___" ____________2023

COMPUTERIZED REMOTE VOICE CONTROL SYSTEM FOR SMART KITCHEN

Bachelor's Degree

"AGREED"	"PERFORMER"
Supervisor	Student of Group ICI-42
________ Yurii Leshchyshyn __	_____ Mlamuli.A.Mthiyane
"___" ____________2023	"___" ____________2023

Ternopil 2023

Terms

This document describes tasks for the development of a computerized remote voice system control of a smart kitchen Equipment by creating a system of a microcontroller and multiple indicators. The main objective is to build a smart kitchen system. The project will be based on the Arduino Uno.

The full name of the project is the Computerized remote voice control system for smart kitchen

Identification:

1.1 Order For System Development

1.2 Performer

Performer - student of ICI-42 group, department of computer systems and networks, Ternopil Ivan Puluj National Technical University, Mlamuli Akim Mthiyane

1.3 Input documents for System development

- Specification of Arduino Uno
- Specification of Relay module(WeMos d1 mini relay shield)
- Specification of Bluetooth module

A. Connecting the Arduino Uno
B. Connecting the Bluetooth module
C. Connecting the Relay module(WeMos d1 mini relay shield)

1.4 Date of Start And Submitting

Planning date of start -
Submission date -

1.5 The sequence of results presentation

Projects consist of the lists of documentation which responds to the approved requirements of the computer systems and networks department. Requirements response to the standards in the field of computer engineering development (ISO standards).

Presentation of intermediate results of the diploma project is carried out according to the schedule approved by the supervisor.

1.6 Standards and regulatory documents

- Standard ANSI/EIA/TIA 568 - “Commercial Building Telecommunications Wiring Standards” and ANSI/EIA/TIA 569 - “Commercial Building Standard For Telecommunications Path waisand Spaces”

2 Appliance and Purpose Of System Design

2.1 Appliance Of System

The Arduino Uno is a microcontroller board. The arduino uno is an improved version of the arduino uno . It is based on the ATMEGA328P microcontroller, which is an 8-bit microcontroller based on the AVR RISC. It is the most popular of all AVR controllers.

2.2 Objective Of The System Design

The objective is to create a computerized remote system of the smart kitchen at a very affordable price.

2.3 Characteristic of Design Object

Arduino Uno, Bluetooth Module, Relay module.

3 System’s Requirement

3.1 Requirements in general

3.1.1 Requirements to the system structure and system operation

The structure of the hardware is to be simple and basic to be carried out easily, but system software must use the available hardware resources as efficiently as possible through the required objective.
The functionality and flexibility of the system is ensured by the modification of the program code of the Arduino Uno and other components

3.1.2 Channels of system components communication

The consistency and the role of every component to be done, for each component to be connected and transferring the actions and getting the reactions through the system.

3.1.3 Requirements to the modes of system operation (normal mode (reliability), emergency mode)

3.1.4 Requirements to the system diagnostic

In order to diagnose the system, it must be monitored using the appropriate tools included in the relevant system software. The tools should provide an easy interface for viewing diagnostic events and monitoring the program execution process.

3.1.5 Perspective of modernization

The system software can be modified to newer versions, the microcontroller can also be replaced with an updated model. Additionally, the other components can be replaced with newer and better versions as time passes. The program code can also be modified to make room for additions of other components.

3.1.6 Requirement to the end users and their qualification

System administrators maintain the system in automatic or manual mode through management and monitoring. The minimum number of service personnel is one person.

3.1.7 Criteria of appliance

The system must be able to scale:

- By productivity

- By capacity of information process
- Scaling capabilities must be provided by the basic software and hardware used.

3.1.8 Reliability requirements

The system must be operational and restored in the following situations:

- If a component outlives its usefulness, it must be replaced as quickly as possible
- When there is a problem with the microcontroller, the reset button can be activated to restart the system. This restart can be all that the problem needs in order to start working properly.

3.1.9 Safety Requirements

The external elements of the technical measures of the system, which are under voltage, must have protection against accidental contact, and the technical measures themselves must have a zeroing or protective grounding GOST 12.1.030-81 and PUE. The power supply system must provide a protective switch during overloads and short circuits in the load circuits, as well as manual emergency shutdown. General fire safety requirements must comply with the standards for household electrical equipment. In the event of fire, no poisonous gasses or vapors should be produced. After disconnecting the power supply, ensure that all fire extinguishers can be used. Harmful factors should not exceed the standards of SanPiN 2.2.2./2.4.1340-03 of 06/03/2003.

3.1.10 Requirements for operation, maintenance, repair and storage of system components

The microclimate in rooms with the corresponding hardware has to correspond to norms of an industrial microclimate (GOST 12.1.005-88).
For normal operation of the network it is necessary to support (according to GOST 23.865-85):
air temperature in the range from + 15C to + 20C;
relative humidity at 20 C in the range from 30% to 70%;
atmospheric pressure 760 mm Hg.
The technical means used must be regularly maintained according to the requirements of the technical documents, but not less than once a year. Regular maintenance and testing of technical means should include maintenance and testing of all used means, including workstations, servers, cable systems and network equipment, and uninterrupted power supplies. According to the test results of technical means, the reasons for the defects should be analyzed and eliminated..

3.1.11 Requirements to standardization and unification

The Arduino Uno is a microcontroller that can be used for multiple purposes and has important features

- It is light and energy efficient
- It is very versatile
- It is programmable and configurable
- It has great connectivity

3.2 Requirements for types of collateral

3.2.1 Requirements to the system's hardware (technical characteristics of each devices in the system)

The system consists of an Arduino Uno, bluetooth module, many others.

3.2.2 Structure and Contest of design system

The composition and content of system design work includes: (translate)
- design and coordination of the technical task for the system;
- system design;
- writing an explanatory note;
- design of graphic material;
- Defense of the qualifying paper.

4 Technical and economic indicators

The cost of development should not exceed 6000 UAH
The service life of the system should be at least 18,000 thousand hours. (2 years)

5 Stages of system design

Number of Stage	Stage	Duration
1	Development and approval of the technical task	

2	Analysis of the technical task	
3	Substantiation of possible technical solutions	
4	System design and implementation	
5	Testing of the designed system	
6	Section of labor protection and safety in emergency situations	
7	Registration of the qualifying paper	
8	Preliminary defense of the qualifying paper	
9	Defense of the qualifying paper	

6 The order of control and acceptance

The control of the process of execution of the diploma project is carried out by the head of the diploma project.

Normal Control of the diploma project for compliance with the requirements of the standards is carried out at the Department of Computer Systems and Networks.
The presentation of the results of the diploma project is done by defending the diploma project at the relevant meeting of the SEC, illustrating the main achievements through the graphic material.

7. Requirements for documentation

The documentation must meet the requirements of ESKD and DSTU Set of design documentation:

- explanatory note;
- applications;

- graphic material;

a) wiring diagrams of the device board through specialized interfaces;
b) block diagram of the device components;
c) algorithms of the created software;
d) block diagram of the device software;
e) the deployment scheme of this solution.

8 Additional Conditions

During the implementation of the thesis project, changes and additions may be made to this technical task.

Appendix B: Sample Program Code

```
#define fan 2
#define bulb 3
#define light 4


void setup() {
// put your setup code here, to run once:
Serial.begin(9600);
pinMode(fan, OUTPUT);
pinMode(bulb, OUTPUT);
pinMode(light, OUTPUT);
}

void loop() {
// put your main code here, to run repeatedly:
if(Serial.available() == 1)
{
String val = Serial.readString();
Serial.println(val);
if(val == "fan on")
{
digitalWrite(fan, HIGH);
}
if(val == "fan off")
{
digitalWrite(fan, LOW);
}
if(val == "bulb on")
{
digitalWrite(bulb, HIGH);
}
if(val == "bulb off")
{
digitalWrite(bulb, LOW);
}
if(val == "light off")
```

```
{
digitalWrite(light, LOW);
}
if(val == "light on")
{
digitalWrite(light, HIGH);
}
if(val == "all on")
{
digitalWrite(fan, HIGH);
digitalWrite(bulb, HIGH);
digitalWrite(light,HIGH);
}
if(val == "all off")
{
digitalWrite(bulb, LOW);
digitalWrite(fan, LOW);
digitalWrite(light, LOW);
}
}
}
```