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EARLY STAGE PREDICTION OF HEART DISEASES USING WIRELESS TECHNOLOGY

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ABSTRACT
Early prediction of heart disease is critical for reducing mortality rates and improving patient outcomes. This project proposes an Arduino-based system for early-stage heart disease prediction using wireless technology. The system incorporates a heartbeat sensor, temperature sensor, LCD, switches, buzzer, voice-speaker, and a GSM module. The sensors monitor vital signs such as heart rate and body temperature, while the Arduino processes the data to detect abnormalities.
The LCD displays real-time health information, and the GSM module sends alerts to healthcare professionals or caregivers when irregularities are detected. A buzzer and voice-speaker provide immediate local alerts. This cost-effective and user-friendly system aims to assist in early diagnosis and timely medical intervention, particularly in remote areas with limited access to healthcare.

INTRODUCTION

Heart disease remains one of the leading causes of death worldwide, necessitating innovative approaches for early detection and management. Traditional diagnostic methods often require regular clinical visits and expensive medical equipment, making them inaccessible for many individuals, particularly in rural or underprivileged areas. Early-stage prediction of heart disease can significantly improve treatment outcomes by enabling timely intervention. Advances in technology have paved the way for compact, affordable, and efficient health monitoring systems that can be used in non-clinical settings.
This project introduces a wireless health monitoring system designed to predict the early stages of heart disease. The system employs an Arduino microcontroller as the central unit, interfaced with a heartbeat sensor and a temperature sensor to monitor critical health parameters. The collected data is processed to identify deviations from normal ranges, which may indicate potential heart conditions. The system provides real-time feedback via an LCD display and activates a buzzer and voice-speaker for immediate local alerts in case of anomalies. Additionally, a GSM module sends SMS alerts to healthcare professionals or designated contacts, ensuring timely assistance.
The inclusion of wireless communication technology enhances the system's utility by enabling remote monitoring and real-time updates. This feature is particularly beneficial for elderly individuals and patients in remote areas who may lack immediate access to medical facilities. By combining affordability, portability, and reliability, this project aims to bridge the gap between technological advancements and accessible healthcare solutions.

LITERATURE SURVEY

Numerous studies have explored the application of wearable and non-invasive technologies for health monitoring. Kumar et al. (2020) demonstrated the use of Arduino-based systems for real-time health tracking, emphasizing the versatility and affordability of the platform. Similarly, Gupta et al. (2019) integrated GSM technology into health monitoring systems to provide remote alerts, highlighting its potential for emergency applications.
Heartbeat sensors have been widely used in health monitoring due to their accuracy and ease of integration with microcontrollers (Patel & Sharma, 2018). Temperature sensors have also proven effective in detecting early signs of infection or fever, which can be precursors to cardiac issues (Verma et al., 2019). The combination of these sensors provides a comprehensive overview of an individual's health status.
Wireless technologies, particularly GSM, have revolutionized remote healthcare by enabling real-time

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communication between patients and healthcare providers (Bose et al., 2021). The integration of voice-based alerts further enhances accessibility, particularly for elderly users or those with disabilities (Sharma et al., 2020). This project builds upon these advancements, creating a unified system that integrates multiple sensors, real-time processing, and wireless communication to predict heart disease at an early stage. The system's affordability and ease of use make it a practical solution for widespread adoption.

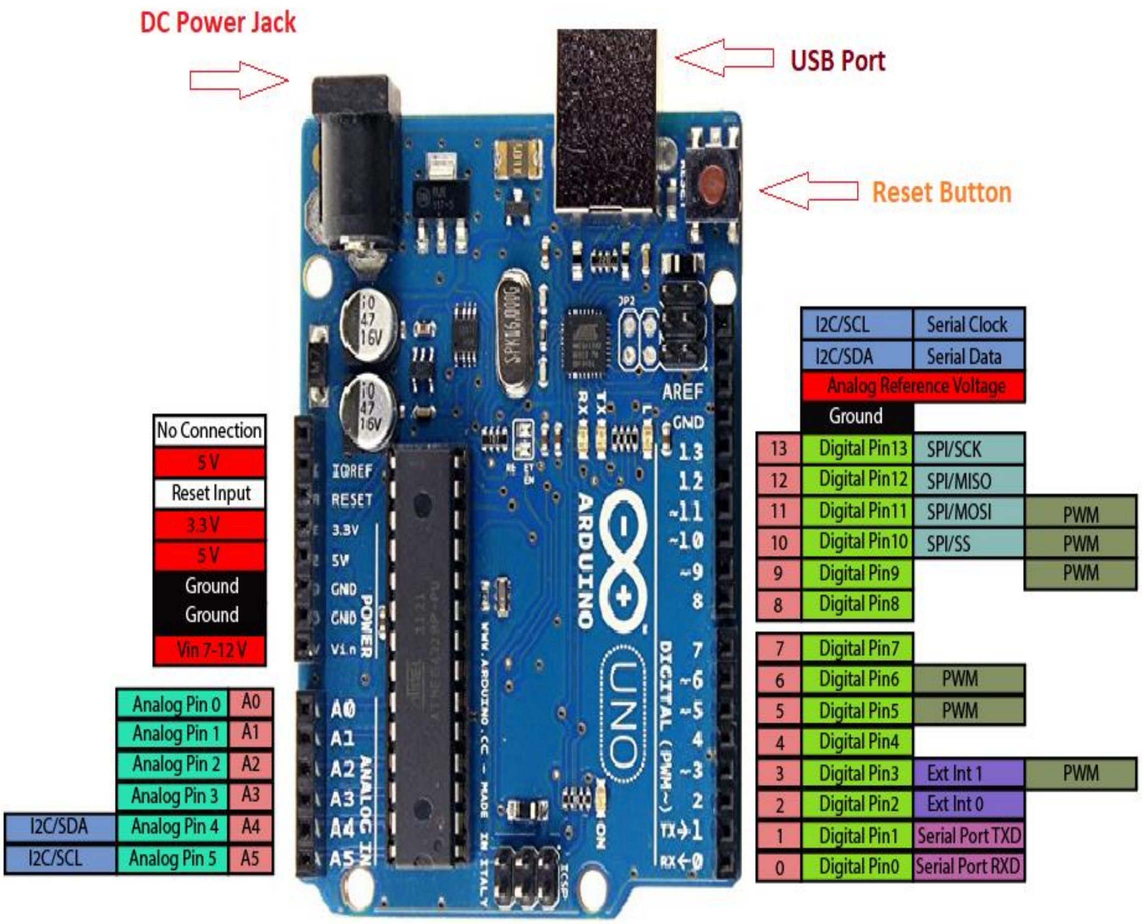

Figure 1 Pin Description

ARDUINO Features

High performance, low power AVR® 8-bit microcontroller

- ✓ Advanced RISC architecture
- ✓ 131 powerful instructions – most single clock cycle execution 8 general purpose working registers×● 32
- ✓ Fully static operation
- ✓ Up to 16MIPS throughput at 16MHz
- ✓ On-chip 2-cycle multiplier
- ✓ High endurance non-volatile memory segments
- ✓ 32K bytes of in-system self-programmable flash program memory
- ✓ 1Kbytes EEPROM
- ✓ 2Kbytes internal SRAM
- ✓ Write/erase cycles: 10,000 flash/100,000 EEPROM

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- ✓ Optional boot code section with independent lock bits
- ✓ In-system programming by on-chip boot program
- ✓ True read-while-write operation
- ✓ Programming lock for software security
- ✓ Peripheral features
- ✓ Two 8-bit Timer/Counters with separate prescaler and compare mode
- ✓ One 16-bit Timer/Counter with separate prescaler, compare mode, and capture mode
- ✓ Real time counter with separate oscillator
- ✓ Six PWM channels
- ✓ 8-channel 10-bit ADC in TQFP and QFN/MLF package
- ✓ Temperature measurement
- ✓ Programmable serial USART
- ✓ Master/slave SPI serial interface
- ✓ Byte-oriented 2-wire serial interface (Phillips I2 C compatible)
- ✓ Programmable watchdog timer with separate on-chip oscillator
- ✓ On-chip analog comparator
- ✓ Interrupt and wake-up on pin change
- ✓ Special microcontroller features
- ✓ Power-on reset and programmable brown-out detection
- ✓ Internal calibrated oscillator
- ✓ External and internal interrupt sources

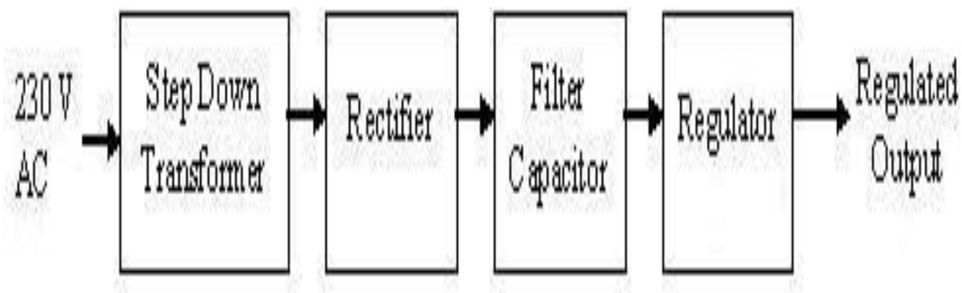

Figure 2 Power Supply

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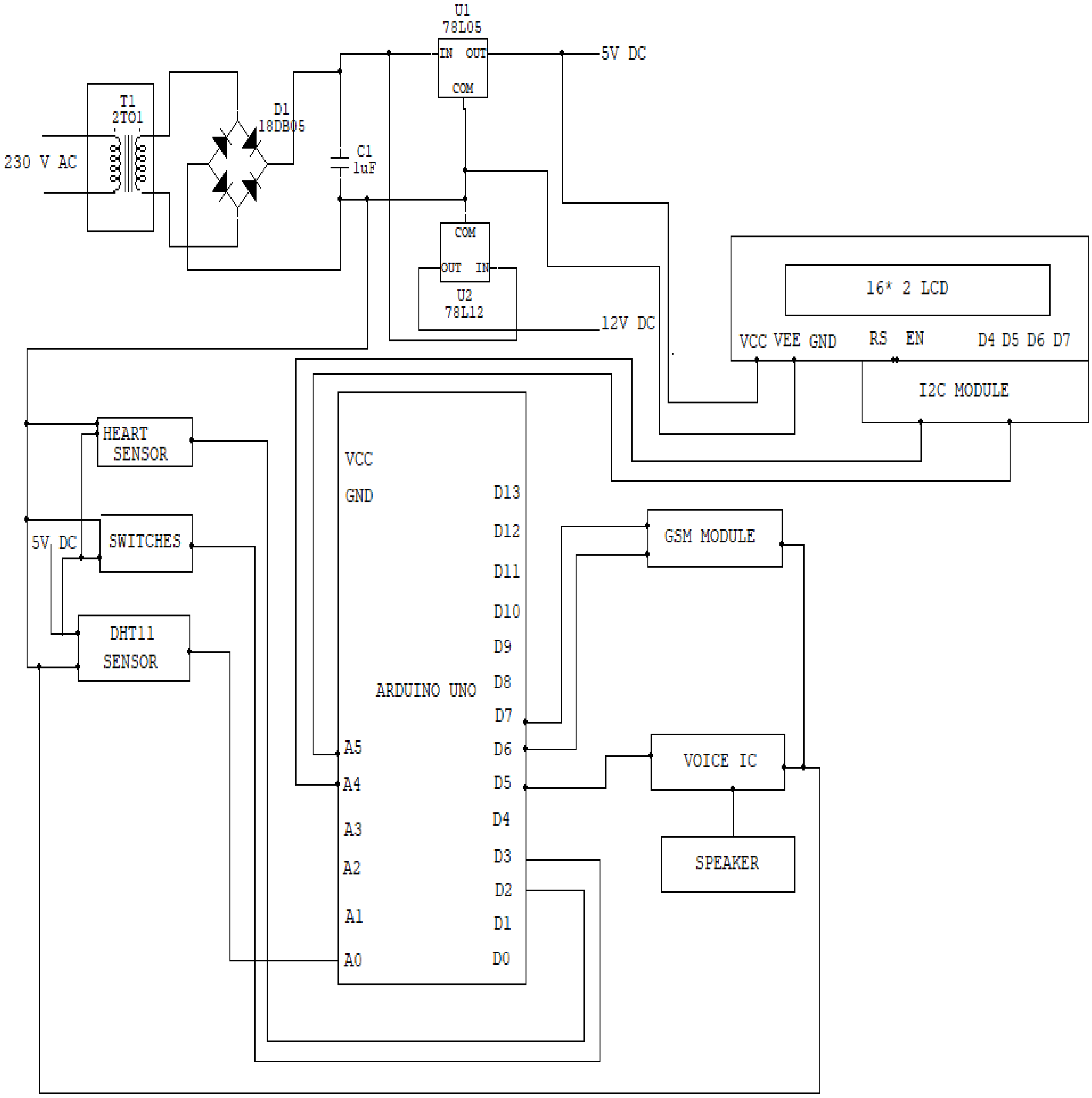

Figure 3 CIRCUIT DIGRAM

Required Parts

- Arduino Uno Board
- Breadboard – half size
- Jumper Wires
- USB Cable
- LED (5mm)
- Push button switch
- 10k Ohm Resistor
- 220 Ohm Resistor

Connect The Parts

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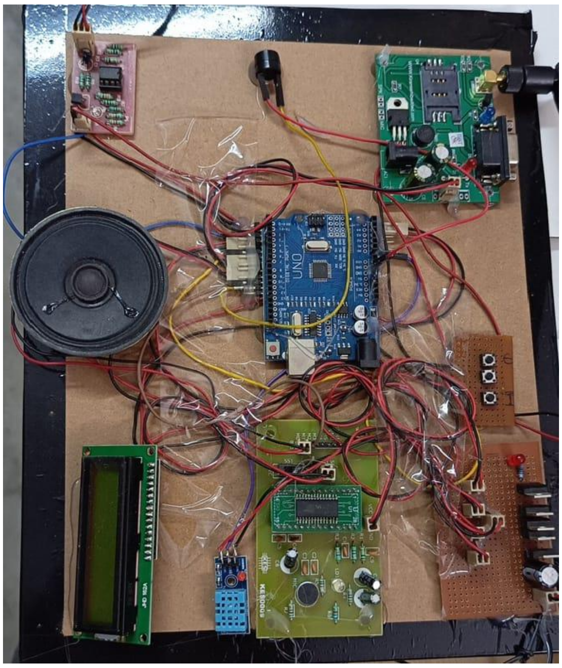
You can build your Arduino circuit by looking at the breadboard image above or by using the written description below. In the written description, we will use a letter/number combo that refers to the location of the component. If we mention H19 for example, that refers to column H, row 19 on the breadboard.

Step 1 – Connect the blue jumper wire from the GND on the Arduino to the GND rail (blue line) on the breadboard near A13
Step 2 – Connect the blue jumper wire from the GND rail on the breadboard near A17 to H19
Step 3 – Connect the red jumper wire from the power rail on the breadboard around row A27 to H26
Step 4 – Connect the green jumper wire from pin 2 on Arduino to J24 on the breadboard
Step 5 – Place one leg of a 10k Ohm resistor in G19 and the other leg in G24
Step 6 – Place the pushbutton switch into F24, F26, E24 and E26
Step 7 – Place one leg of a 220 Ohm resistor in D5 and the other leg in G5
Step 8 – Insert the short leg of the LED in the GND rail around A5 and the long leg in B5
Step 9 – Connect the black jumper wire from pin 13 on the Arduino to I5 on the breadboard
Step 10 – Connect the red jumper wire from 5V on the Arduino to power rail (+) near A8
Step 11 – Connect the Arduino Uno to your computer via USB cable

Upload The Switch Sketch

Now it's time to upload the sketch to the Arduino that will allow us to use a switch. As with the blink sketch, there are example programs already loaded in the Arduino IDE that we will be using.

RESULTS



CONCLUSION

The proposed system for early-stage prediction of heart disease combines the functionalities of heartbeat and temperature sensors, wireless communication, and real-time alerts to provide a reliable and efficient health monitoring solution. The integration of a GSM module ensures that critical health data is communicated promptly to caregivers, facilitating timely medical intervention. By leveraging affordable and accessible technology, this system addresses the challenges of traditional healthcare and aims to improve outcomes for patients, particularly in remote areas. With its user-friendly interface and robust design, this project has the potential to make a significant impact in the field of preventive healthcare.

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FUTURESCOPE

The future of early-stage heart disease prediction is moving towards proactive, personalized, and AI-driven healthcare. By leveraging wearable tech, AI, and big data, early detection and prevention will become more accessible, ultimately reducing mortality rates and healthcare costs.

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