

IoT BASED HEART RATE MONITORING SYSTEM
Z21454 - INTERNET OF THINGS LABORATORY
MINI PROJECT REPORT

Submitted by

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In partial fulfilment of the requirement of the program

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ABSTRACT

The report describes a pulse detecting system that utilizes a pulse sensor and ESP (Embedded System Platform) for real-time monitoring of pulse rate. The system includes a pulse sensor that measures the user's pulse rate noninvasively and an ESP that collects and processes the pulse data. The ESP is equipped with Wi-Fi connectivity, allowing it to send the pulse rate data to Telegram, a popular instant messaging application, for remote monitoring. The system offers a convenient and noninvasive way to monitor pulse rate in real-time, making it suitable for various healthcare and fitness applications. The report discusses the design and implementation of the system, including the integration of the pulse sensor and ESP, as well as the setup of the Telegram communication. The results of the system's performance and accuracy in detecting pulse rate are also presented. The report concludes with potential future enhancements and applications of the pulse detecting system using the pulse sensor and ESP with Telegram integration.

APPARATUS REQUIRED

S.no	Name of the component	Description	Quantity
1.	Node MCU	ESP8666	1
2.	PULSE SENSOR	Heart Beat sensor	1
3.	Telegram Bot	Bot Father	-
4.	Interfacing Cable	USB A – USB B	1
5.	Jumper Cables	Female-Female	Few

1.Node MCU[ESP8266]:

- NodeMCU ESP8266 is a low-cost microcontroller module that is based on the ESP8266 chip.
- It is widely used in the field of the Internet of Things (IoT) and is particularly popular among hobbyists and developers due to its easy-to-use interface and powerful capabilities.
- It can be programmed using the Arduino IDE and can be used to build a wide range of IoT projects, such as home automation systems, environmental monitoring systems, and smart home devices.



2.PULSE Sensor:

- The working of this sensor can be done by connecting it from the fingertip or human ear to Arduino board. So that heart rate can be easily calculated.
- This sensor has two surfaces, on the first surface, the light-emitting diode & ambient light sensor is connected. Similarly, on the second surface, the circuit is connected which is accountable for the noise cancellation& amplification.
- The LED is located above a vein in a human body like ear tip or fingertip, however, it must be located on top of a layer directly. Once the LED is located on the vein, then the LED starts emitting light. Once the heart is pumping, then there will be a flow of blood within the veins..



3.Bot Father - Telegram:

- BotFather is a bot on Telegram that manages all the bots that you create via your account on Telegram. You can reach him by searching **@BotFather** on Telegram and you should see this profile
- To see what he can do, send **/start** or **/help** in the chat with BotFather, and you should see a list of commands that he has.



4.Interfacing Cable:

- NodeMCU ESP8266 interfacing cable is a cable used to connect the NodeMCU ESP8266 microcontroller to other devices or peripherals.
- The cable typically has a USB connector on one end and a micro-USB connector on the other end, which is used to connect to the NodeMCU ESP8266 module.
- The cable is used for programming the NodeMCU ESP8266 module and for transferring data between the module and other devices.

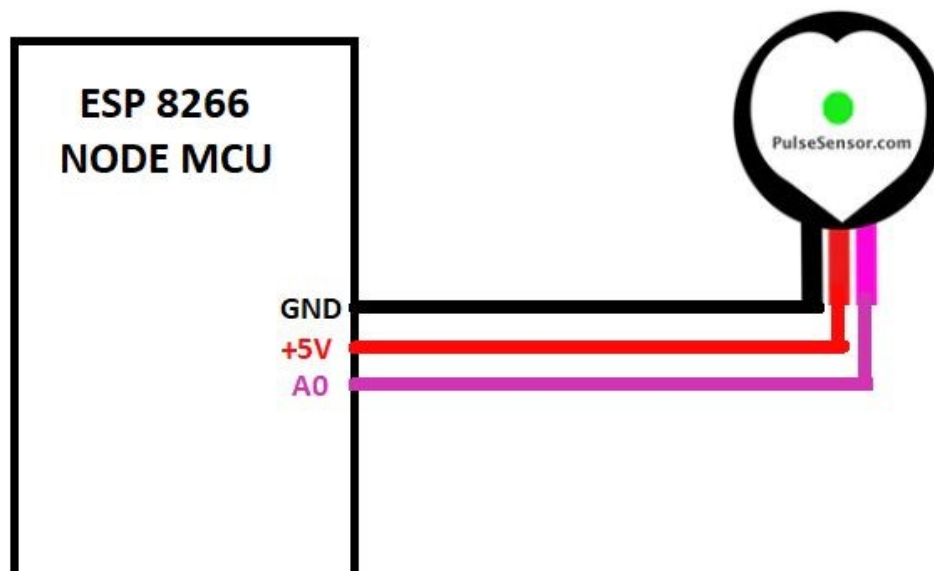


5.Female-Female Jumper cables:

- Female-to-female jumper cables are a type of wiring that is commonly used to connect two female headers or sockets together.



CIRCUIT DIAGRAM



System Design Template

Parameter	Device Type	Description
Digital inputs	PULSE sensor	The Pulse sensor is used to check the patients Heart Beat and send the Output.
Communication interface	BOT FATHER - TELEGRAM	BOT FATHER is a channel that will allow any user to create telegram bots freely.
Memory	NODE MCU consist of 80KB of RAM and 4MB of flash memory	Flash memory to store the program and the data received from the PIR sensor.

WORKING PRINCIPLE

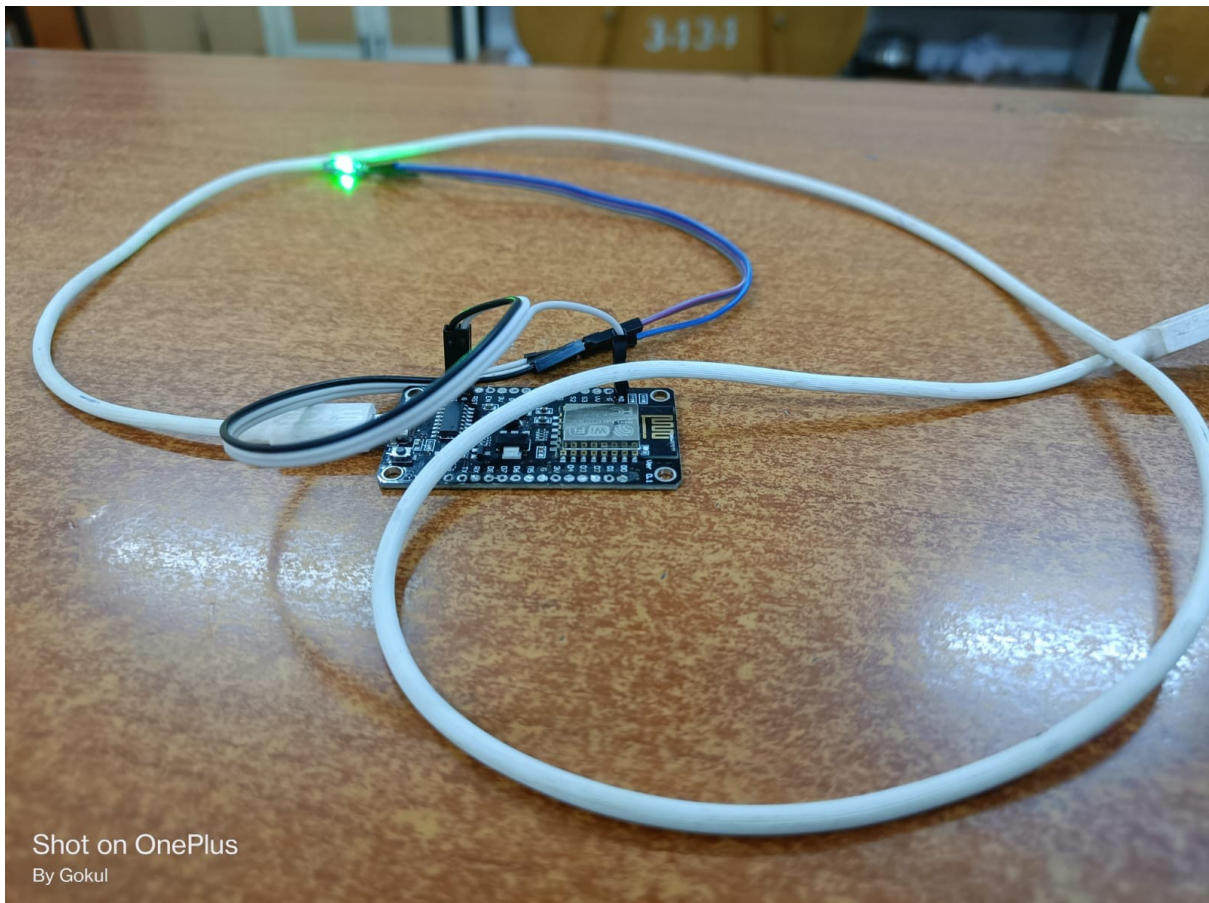
- The pulse sensor working principle is very simple. This sensor has two surfaces, on the first surface, the light-emitting diode & ambient light sensor is connected. Similarly, on the second surface, the circuit is connected which is accountable for the noise cancellation& amplification.
- The LED is located above a vein in a human body like ear tip or fingertip, however, it must be located on top of a layer directly. Once the LED is located on the vein, then the LED starts emitting light. Once the heart is pumping, then there will be a flow of blood within the veins. So if we check the blood flow, then we can check the heart rates also.
- If the blood flow is sensed then the ambient light sensor will receive more light as they will be reproduced by the flow of blood. This small change within obtained light can be examined over time to decide our pulse rates.

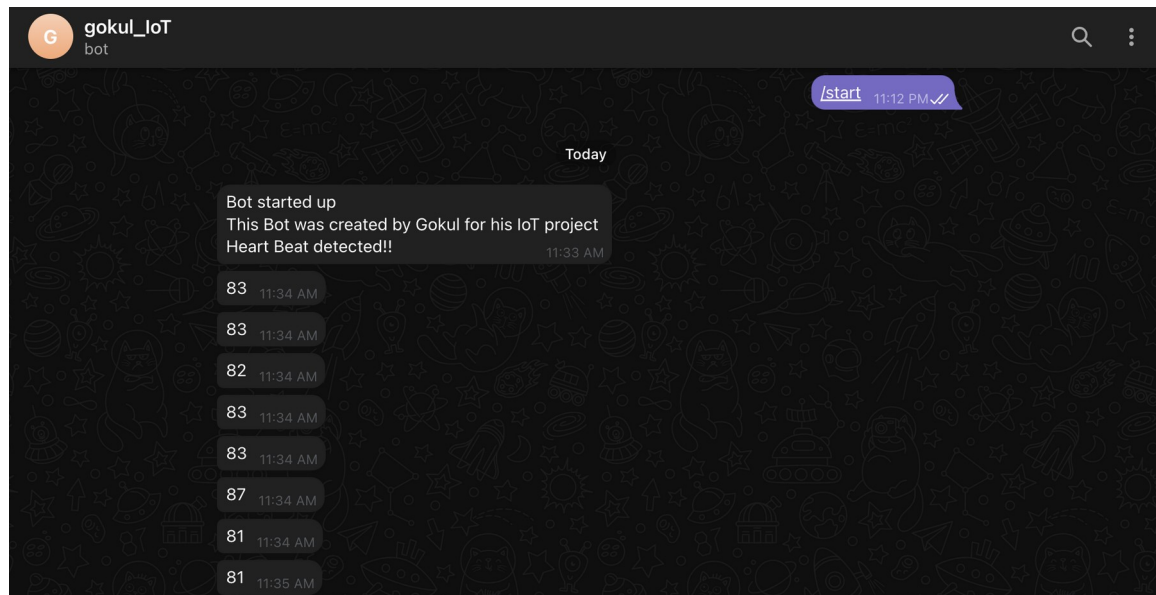
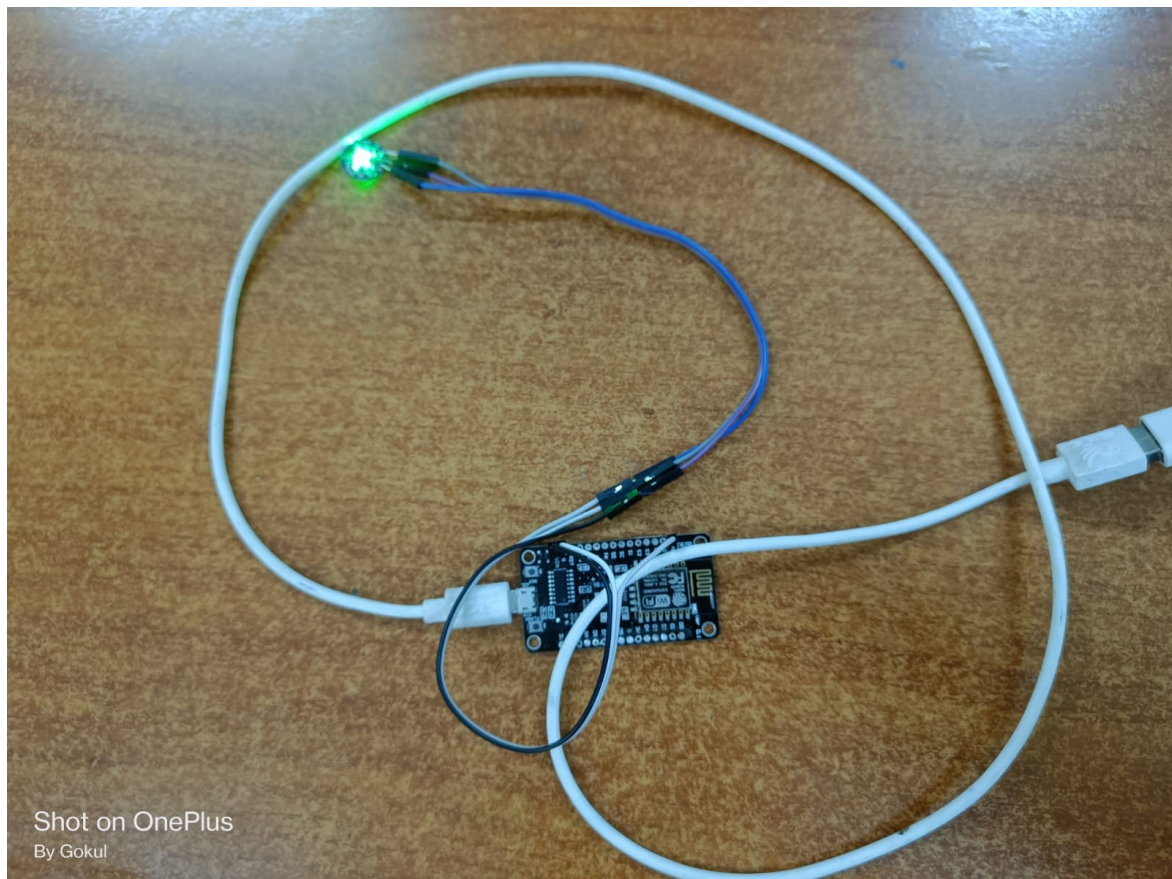
OUTPUT:

```
. Variables and constants in RAM (global, static), used 31056 / 80192 bytes (38%)
| SEGMENT  BYTES  DESCRIPTION
| DATA    1620   initialized variables
| RODATA   3316   constants
| BSS      26120  zeroed variables
. Instruction RAM (IRAM_ATTR, ICACHE_RAM_ATTR), used 60667 / 65536 bytes (92%)
| SEGMENT  BYTES  DESCRIPTION
| ICACHE   32768  reserved space for flash instruction cache
| IRAM     27899  code in IRAM
. Code in flash (default, ICACHE_FLASH_ATTR), used 362692 / 1048576 bytes (34%)
| SEGMENT  BYTES  DESCRIPTION
| IROM     362692 code in flash
esptool.py v3.0
Serial port /dev/cu.usbserial-110
Connecting...
Chip is ESP8266EX
Features: WiFi
Crystal is 26MHz
MAC: 48:55:19:12:f6:f5
Uploading stub...
Running stub...
Stub running...
Configuring flash size...
Auto-detected Flash size: 4MB
Compressed 399680 bytes to 295958...
Writing at 0x00000000... (5 %)
Writing at 0x00004000... (10 %)
Writing at 0x00008000... (15 %)
Writing at 0x0000c000... (21 %)
Writing at 0x00010000... (26 %)
Writing at 0x00014000... (31 %)
Writing at 0x00018000... (36 %)
Writing at 0x0001c000... (42 %)
Writing at 0x00020000... (47 %)
Writing at 0x00024000... (52 %)
Writing at 0x00028000... (57 %)
Writing at 0x0002c000... (63 %)
Writing at 0x00030000... (68 %)
Writing at 0x00034000... (73 %)
Writing at 0x00038000... (78 %)
Writing at 0x0003c000... (84 %)
Writing at 0x00040000... (89 %)
Writing at 0x00044000... (94 %)
Writing at 0x00048000... (100 %)
Wrote 399680 bytes (295958 compressed) at 0x00000000 in 28.8 seconds (effective 111.2 kbit/s)...
Hash of data verified.

Leaving...
Hard resetting via RTS pin...
```

```
11:33:47.949 -> .....  
11:33:53.687 -> WiFi connected  
11:33:53.687 -> IP address: 192.168.120.179  
11:33:53.687 -> Bot started up  
11:33:53.687 -> Heart Beat detected!!  
11:33:58.734 -> 83  
11:34:05.142 -> 83  
11:34:05.142 -> 83  
11:34:16.264 -> 83  
11:34:16.264 -> 82  
11:34:31.480 -> 82  
11:34:31.480 -> 83  
11:34:36.330 -> 83  
11:34:36.330 -> 83  
11:34:41.777 -> 83  
11:34:41.777 -> 87  
11:34:46.824 -> 87
```





CONCLUSION

Thus, we have successfully Detected Pulse and sent message to Telegram with the help of BOT FATHER. In future we will further upgrade the project using a Temperature Sensor which will detect the Temperature of the patient and send it to Telegram.