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Remotely Controlled Robotic Arm with Monitoring

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Abstract

This paper presents the development of a remotely controlled robotic arm with monitoring capabilities using the Internet of Things (IoT). The proposed robotic arm is designedto be used in a variety of applications that require precise and accurate manipulation of objects over a long distance. The system is composed of several hardware components, including an ESP32 microcontroller, a wireless controller, a robotic arm, and a camera. The ESP32 microcontroller is responsible for controlling the movements of the robotic arm, while the wireless controller provides a user-friendly interface for controlling the system.

The IoT capabilities of the system enable remote monitoring of the robotic arm's performance, allowing users to track its movements and receive alerts in case of any issues. Thecamera provides a live video stream of the robotic arm's workspace, enabling users to monitor the system in real-time. The system is designed to be portable and easy to use, making it suitable for a wide range of applications, including manufacturing, agriculture, and healthcare.

Introduction:

In recent years, there has been a growing demand for systems that can easily connect devices for the transfer of data over long distances without cables. This project presents the development of a remotely controlled robotic arm that can perform pick-and-place operations and can be controlled using wireless communication. The robot can move forward, reverse, turn right and left for a specific distance according to the controller specification. The development of this robot is based on the ESP32 Microcontroller platform, which is interfacedwith the wireless controller to the mobile robotic arm. The robot's performance is analyzed in terms of speed, distance, and load that can be lifted. This project also incorporates IoT technology to enable remote monitoring of the robot's operation. The robot's movements and status can be monitored remotely using a mobile application, which allows the user to control the robot and receive real-time updates on its movements. The project's goal is to address the problem of placing or picking objects that are far away from the user and to provide a faster and easier way to pick and place hazardous objects. The robot can be used in various industries,such as manufacturing, warehousing, and construction, to perform repetitive and hazardous tasks, thus increasing productivity and safety. The project's outcome is a prototype of the robot that can perform pick-and-place operations and be remotely

controlled and monitored using IoT technology.

Literature Review:

The use of robotic arms has gained increasing attention in various fields such as and even surgery. However, the development of a remotely controlled robotic arm with In terms of the IoT, it has enabled the development of smart systems that can monitor efficient manner while allowing for remote monitoring and control.

Methods and Materials:

The methodology followed in this project involves the design, development, and testing of a remotely controlled robotic arm with monitoring using IoT technology. The project involves the integration of hardware components such as motors, sensors, microcontroller, and communication modules. The software development involves programming the microcontroller, developing a user interface, and integrating the IoT technology.

The ESP32 microcontroller is used to control the motors and sensors, and to establish communication with the user interface and IoT platforms. The L293D motor driver is used to drive the DC motors, and the Wi-Fi and Bluetooth modules are used for wireless communication. The power supply for the project is provided by a 12V battery, which is regulated using voltage regulator ICs.

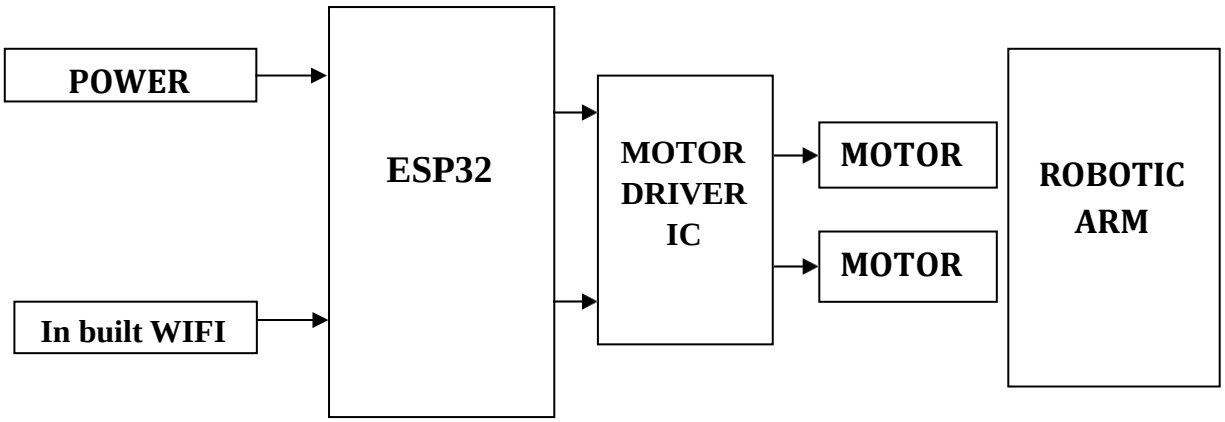


Fig 1: Block Diagram of Robotic Arm

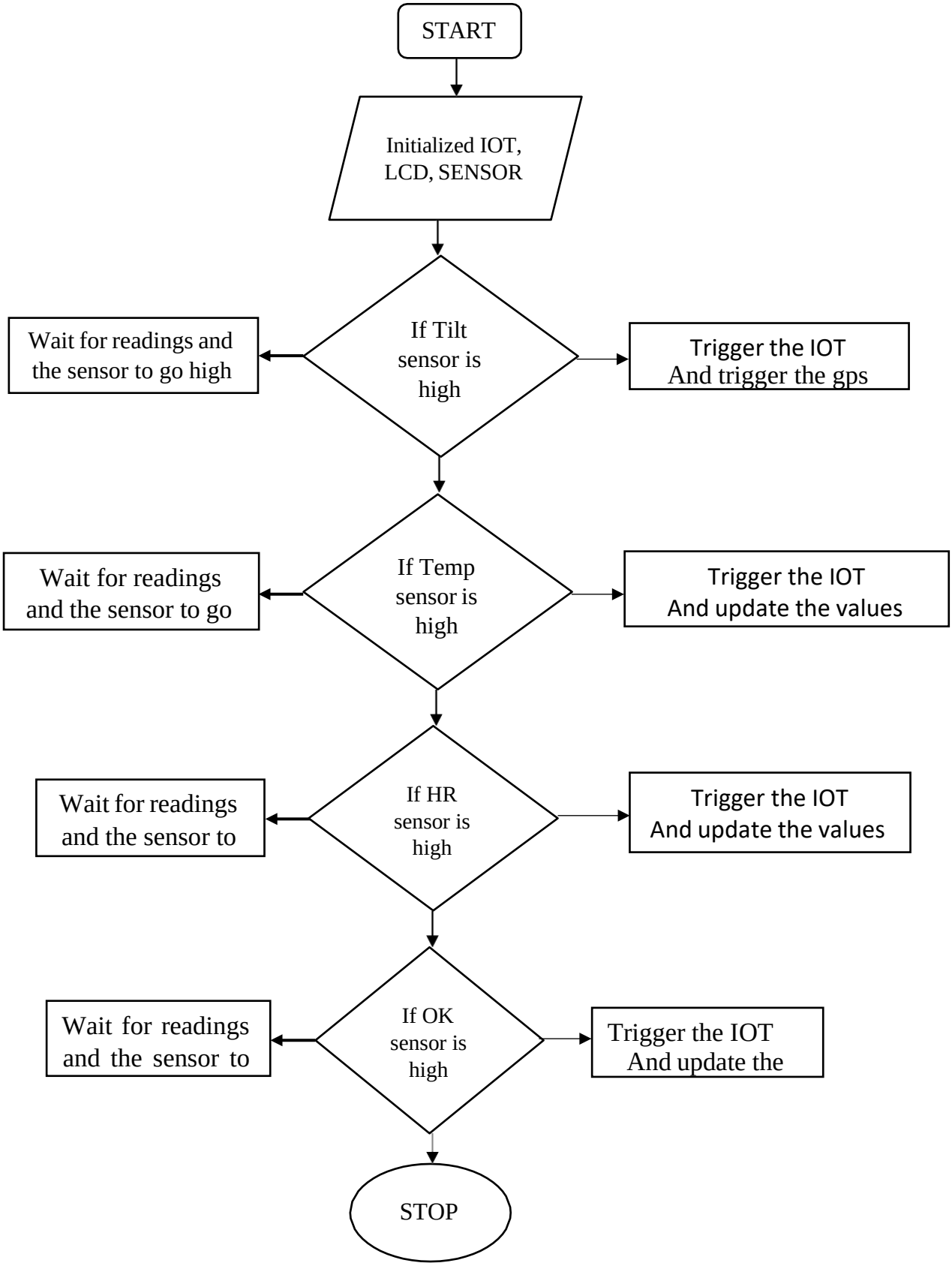
The project involves the use of advanced technologies such as IoT, which enable remotemonitoring and control of the robotic arm. The methodology and materials used in the project are carefully selected to ensure optimal performance and reliability of the system.

Table 1: Required Components, Quantity, and price

EQUIPMENT	QUANTITY	PRICE (INR)
Power Supply	1	200
ESP32 Cam	1	450
ESP32 Microcontroller	1	380
Arm Assembly	1	1000
DC Motor	3	165
Regulator	1	65
		TOTAL: 2260

Figure.1: Required Components for development

Flowchart:


START
Initialized IOT, LCD, SENSOR
If Tilt sensor is high
Wait for readings and the sensor to go high
Trigger the IOT And trigger the gps
If Temp sensor is high
Wait for readings and the sensor to go
Trigger the IOT And update the values
If HR sensor is high
Wait for readings and the sensor to
Trigger the IOT And update the values
If OK sensor is high
Wait for readings and the sensor to
Trigger the IOT And update the
STOP

Result & Analysis:

A remotely controlled robotic arm with monitoring is a device that allows a user to monitoring can increase safety, efficiency, and accuracy in a variety of applications. After completing the implementation phase, the robotic arm and wireless controller functionality of the system by performing various tasks, such as pick-and-place operations, system's response time, accuracy, stability, and range are measured and recorded. Any errors system meets the project's requirements and specifications. Hardware and software implementation are critical components of this project, but controller system are tested to verify that they perform as expected, and the results of these specifications.

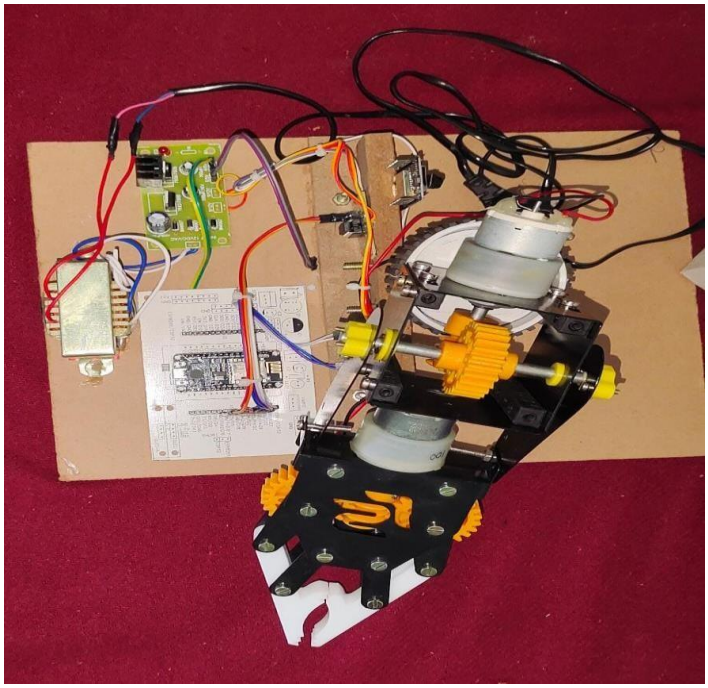
Future Work:

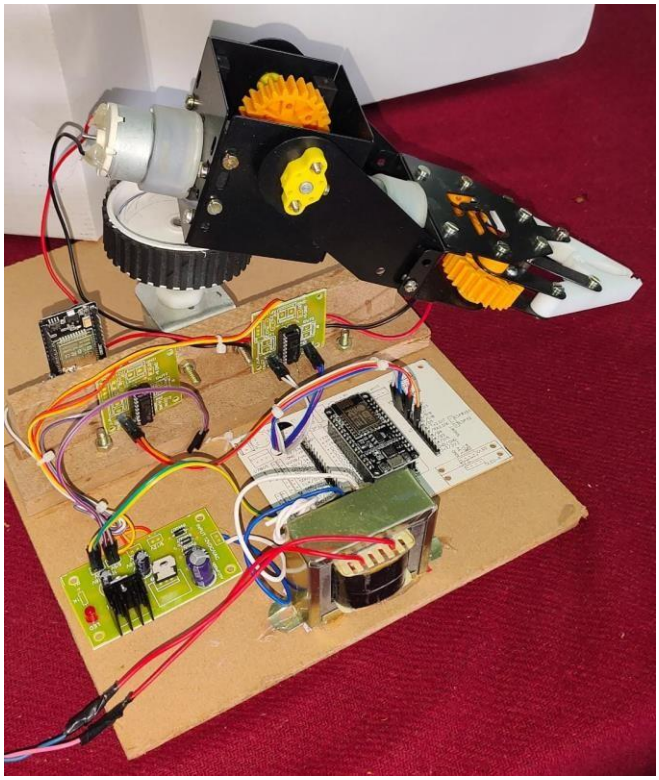
The project has provided a foundation for future work in the area of wireless mobile robotic arms. Some of the areas that could be explored in future work include:

1. Increasing the range of the wireless controller to extend the operating range of therobotic arm.
2. Enhancing the load capacity of the robotic arm to enable it to handle heavier objects.
3. Improving the accuracy and precision of the robotic arm for more complex tasks.
4. Exploring the use of advanced sensors and algorithms for obstacle avoidance and navigation.

In conclusion, the project has demonstrated the potential of wireless mobile robotic arms in various applications, including manufacturing, healthcare, and logistics. With further advancements in technology, wireless mobile robotic arms are expected to play an increasingly important role in various industries.

Result:





Conclusion:

The conclusion section of the project documentation provides a summary of the project, its achievements, limitations, and future work.

The project aimed to develop a wireless mobile robot arm that can be remotely controlled using a wireless controller and connected to IoT for monitoring and data transfer. The project involved designing and implementing the hardware and software components of the system, integrating IoT with the robotic arm, and testing the system's performance. The project was successful in achieving its objectives, and the results showed that the system was able to perform the pick-and-place operation as intended.

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