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IOT BASED ROBOTIC ARM

Ashwini K .More [1] , Akshay J. Lohar [2] , Rohit L. Ingole [3] , Rohan D. Firake [4] .

Department of Computer Engineering, Savitribai Phule Pune University, Pune, India.

TSSM's Bhivarabai Sawant College of Engineering & Research, Pune-41.

(Prof.Puja R.Patil ,Department of Computer Engineering, Savitribai Phule Pune University, Pune, India.)

ABSTRACT

In this abstract, we present a unique approach that combines Internet of Things (IoT) principles with a robotic arm to enhance its capabilities. By leveraging IoT connectivity and data exchange, the robotic arm can collect and process real-time environmental data, enabling it to adapt to changing conditions and perform complex tasks with precision and efficiency. The system also incorporates machine learning algorithms for continuous improvement and offers remote monitoring and control. This integration opens up opportunities for various industries, such as healthcare and logistics, by enabling safer, more efficient, and versatile robotic systems.

Internet of Things (IoT), robotic arm, industrial automation, control system, sensor network, cloud platform, user interface.

Keywords:

INTRODUCTION

The integration of Internet of Things (IoT) technologies with robotic arms has ushered in a new era of intelligent automation. This paper explores the potential and challenges of IoT-based robotic arms, which offer unprecedented connectivity, adaptability, and remote control capabilities. By leveraging IoT connectivity, these robotic arms can dynamically respond to real-time environmental data, enabling enhanced perception and decision-making. Additionally, the fusion of IoT and robotics allows for remote monitoring and control, collaborative scenarios, and continuous learning through machine learning algorithms. However, security, privacy, data management, and interoperability pose critical challenges in this ecosystem. This paper aims to investigate the advancements, implementations, and applications of IoT-based robotic arms, highlighting the transformative potential of this convergence.**I.**

METHODOLOGY

A mathematical model of an IoT-based robotic arm usually includes the kinematics and dynamics of the arm. Here i s a s implified mathematical model that you can use as a starting point:

1. Kinematics:

The kinematics of the robot arm determines the relationships between the joint angles or positions and the position of the final power amplifier in space. If the joint angles or positions are indicated by q1, q2, ..., qn (where n is the number of joints) and the position of the end effector (x, y, z), the forward kinematics can be represented by a . set of equations:

x = f1(q1, q2 , ..., qn)

y = f2(q1, q2, ..., qn)

z = f3(q1, q2, ..., qn)

The functions f1, f2 and f3 are usually determined by the geometry of the arm and the type of joints used (eg rotary, prism) . 2. Dynamics:

Robotic arm dynamics involves modeling the forces and torques acting on the arm, taking into account factors such as gravity,

joint friction and inertia. A dynamic model can be represented as follows:

M(q) * q" C(q, q') * q' G(q) = τ

Where:

- q" is the vector of joint accelerations. - q' is the vector of joint velocities. - M(q) is the inertia matrix that relates joint

accelerations to joint torques. - C(q, q') is a matrix of Coriolis and centrifugal terms, which explains the connections between connections. - G(q) is the gravity vector that takes into account the gravitational forces acting on the hand. - τ is the vector of joint moments or upper arm forces.

The specific form of M(q), C(q, q'), and G(q) depends on the mechanical structure of the stem, such as mass distribution, bond length, and joint types.

3. Management:

In an IoT-based system, you can add additional features such as sensor feedba ck and communication capabilities to enable remote control and monitoring of the robotic arm. Note that the complexity of the mathematical model can vary depending on the specific design of the robotic arm, the level of detail required, and the intended application. The template described above provides a basic framework that can be further

expanded and refined to meet your specific needs.

NP analysis:

When performing an NP analysis for an IoT-based robotic arm project, consider several fa ctors related to network infrastructure, device integration, data management, power requirements, scalability, security, and project management. Here are some important points to consider:

1. Network infrastructure:

- Assess network requirements for communication between the robotic arm and other components. Consider factors such as latency, bandwidth, reliability and security. - Define connection options such as Wi -Fi , Ethernet or cellular networks according to the specific needs of the project. - Assess the network architecture and infrastructure to ensure i t supports the

communication requirements of the robotic arm. 2. Device integration:

- Analyze the compatibility of the robot arm with the IoT ecosystem. Investigate whether the hand contro l system can be

seamlessly integrated with other IoT devices or platforms. - Consider the communication protocols needed to communicate between the robotic arm and other devices or systems. - Evaluate the ease of device configuration and deployment in an IoT network. 3. Management and processing of data:

- Evaluate data generated by the robotic arm, such as joint angles, position feedback and sensors. Define data storage and

- processing requirements. - Consider the frequency and amount of data transfer and whether cloud or edge

- computing

solutions are needed. –

Assess the need for real -time data analysis or historical data analysis to optimize arm performance. 4.

Power and energy management:

Assess the power requirements of the robotic arm, inclu ding motors, actuators and control systems. Set options such as power source or battery. - Evaluate energy efficiency measures to optimize energy consumption and, i f necessary, extend battery l i fe. - Consider other power management features such as power monitoring or energy harvesting.

5. Scalability and Extension:

- Assess the scalability of the robotic arm system for future growth or additional functions. - Assess the impact of system scale on network infrastructure, data management and computing resources. - Consider the ease of integrating new robotic arms or expanding an existing system to handle multiple arms s imultaneously.

6. Security and Privacy:

- Assess the security risks associated with robotic arm connectivity and data transmission . Identify potential vulnerabilities and develop security measures accordingly. - Consider authentication mechanisms, cryptographic protocols and access control to ensure the security of

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the arm's work. - Ensures compliance with data protection regulation s and implements measures to protect sensitive information. 7. The head of the project:

- Develop a comprehensive project plan that includes timelines, milestones and resource allocation. - Identify potential risks and dependencies related to network infrastructure, device integration or data management.
- Consider budget constraints and assess the financial feasibility of the project.

By conducting a thorough NP analysis of an IoT-based robotic arm project, you can identify potential challenges, make informed decisions, and develop a well -structured plan to ensure the project's success.

MODELING AND ANALYSIS

1. Responsibilities of the programmer

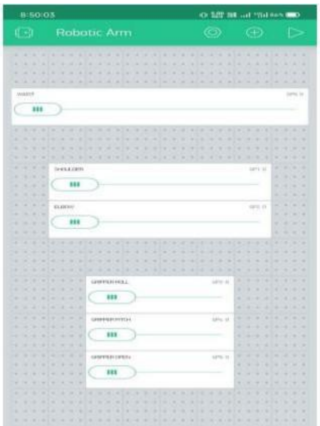
The developer has to develop Find Perfect Server to transfer data and store integers and present in the application UI and a lso maintain IEEE standardized IOT Stander protocols. We need to connect some electronic co mponents the data sent by the user's esp32 microcontroller to the Wi - Fi module that forms the pipeline between the iot cloud and the robot body.

2. External UI

Condition 2.1

BLYNK IOT

Blynk i s an IOT platform where we quickly build projects to control and monitor information using mobile phones such as Android and IOS devices. Another advantage i s when the project panel and widgets such as button, screen, s l iders, etc. are called gripper, left and right, up and down to control



microcontrollers and other superficial. we can control the machine and with the help of these devices we can check the sensor data on the phone screen.

Property of the system:-

The key features of IoT where it works are connectivity, analytics, integration, active engagement and more. Some of them are listed below

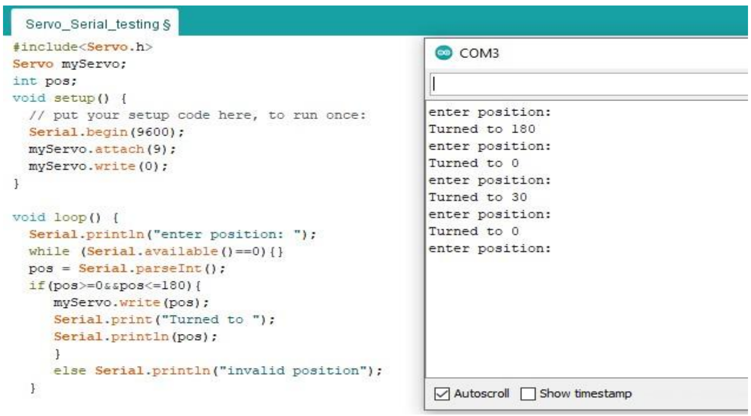
Connections: Connection means making a proper connection between the entire IoT and IoT platform, it can be a server or a cloud. Once IoT devices are connected, it needs high-speed communication between the devices and the cloud to enable

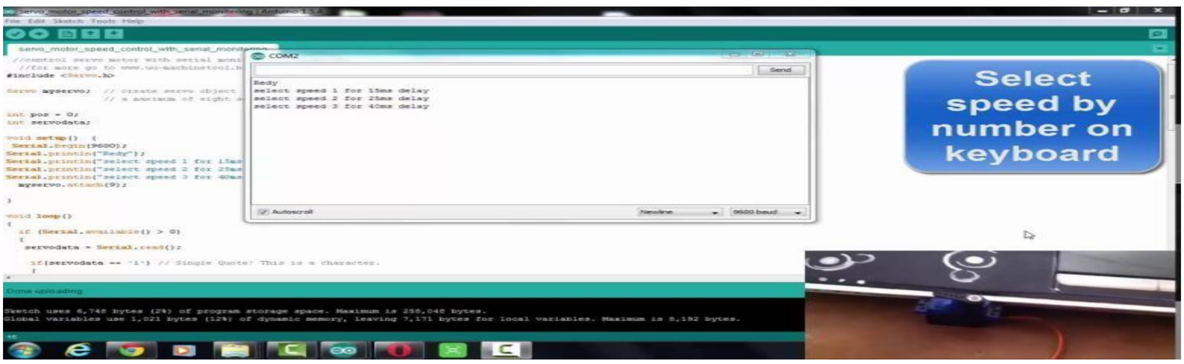
reliable, secure and two-way communication. Analysis: Once everything important is assembled, it's time to analyze the

Collected data in real time and use it to create effective business intelligence. When we have a good understanding of the information gathered about all these things, we call our system an intelligent system. Integration: IoT integrates different models to improve the user experience as well. Sensing: Sensors used in IoT technologies detect and measure changes in the

Environment and report their status. IoT technology brings passive networks into active networks. Without sensors, you cannot maintain an efficient or true IoT environment.

RESULTS AND DISCUSSION





II.CONCLUSION

Iot Base's robot arm performs one task and can be reworked to perform another. It provides versatility to the production line and replaces tedious pick and place tasks. Increased efficiency and speed increase performance and reduce problems. Robotic arms were originally designed to assist mass production factories, most famously in the production of automobiles. They were also introduced to reduce the risk of injury to workers and to perform monotonous tasks so that workers could focus on the more complex parts of production. Industrial robots handle products quickly and delicately in applications such as picking and assembly line packaging. Robotic pallet devices load the packaged goods onto the pallet

I. ACKNOWLEDGEMENTS

Thank you should be in the same hierarchy: your guide, head of department, director, management, laboratory nurses, friends and family. Use separate paragraphs to recognize each category. This may take 1 or 2 pages - if it exceeds one page, it must be printed consecutively. This means that credit must be given in one work. Always use a "justification" for every paragraph you write in your report.

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