INTERNET OF THINGS (IOT) BASED ROBOTIC ARM

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Abstract - The ongoing revolution of Internet together with the growing robotics in many activities of everyday life. Internet of things has taken over all the heavy loads from human to itself. Internet of Things (IOT) is basically a connection of many devices to interconnect themselves. As Robots are used to help mankind in various environments if we combine the Robots and Internet of things we can achieve more than we can think of. This project discusses technological implications, open issues, and target applications in the IoT-aided robotics domain.

1. INTRODUCTION

For the people who are indulged in electronics either as a hobby or as a profession who kind off happens to have more interest in robotics this project is the key in which most of precise work which humans cannot do repeatedly, this is where a robotic arm or we can say a pick n place robot comes into picture.

Robotics is the branch of mechanical engineering, electrical engineering and computer science that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing. A Robotic arm is a type of mechanical arm, usually programmable, with similar functions to a human arm; the arm may be the sum total of the mechanism or may be part of a more complex robot. The links of such a manipulator are connected by joints allowing either rotational motion (such as in an articulated robot) or translational (linear) displacement.

The internet of things (IoT) is the network of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure.

2. BLOCK DIAGRAM

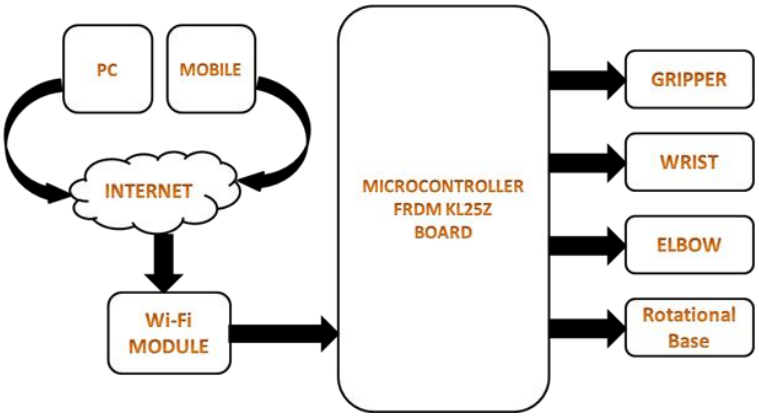

Fig -1: Block diagram and work flow of the project.

3. DESCRIPTION

The main part of the project is the robotic arm, which can pick and place things from one place to another. To control this action we can move the robotic arm by giving specific commands. The robotic arm is equipped with servo motors. These motors help to move the arm in desired direction. The motors are controlled with the help of a micro controller(FRDM KL25Z). The user interface which is used to control the robotic arm is made on a web page or an app. The control is given via the internet to the wifi module(ESP8266). This acts as the receiver and gives the received signal to the microcontroller.. The signal which is given to the robotic arm is actually sent through the internet

and hence we can access the robot from any place. However the web page or the app must require a login ID and a password for security reasons, for a particular person to control the robotic arm. The movements which are made by the robotic arm can be recorded and saved. In this way the arm can do the same movements repeatedly whenever needed.

4. IOT(Internet Of Things)

The Internet of things (IoT) is the internetworking of physical devices. The concept was simple but powerful. If all objects in daily life were equipped with identifiers and wireless connectivity, these objects could be communicating with each other and be managed by computers.

The Three Cs of IoT:

Communication -It is the interconnection between the user and system/device.

Control and Automation - It is programmed once as if any changes in output parameter it will alert the uses and hence it can be control or it can be automated for any particular work.

Cost Savings - Many companies will adopt IoT to save money. As when a machine loses to fulfill a company product on time the company will lose its money. With new sensor information, IoT can help a company to save money by reducing equipment failure and allowing the business to perform perfectly.

5. FRDM KL25Z BOARD

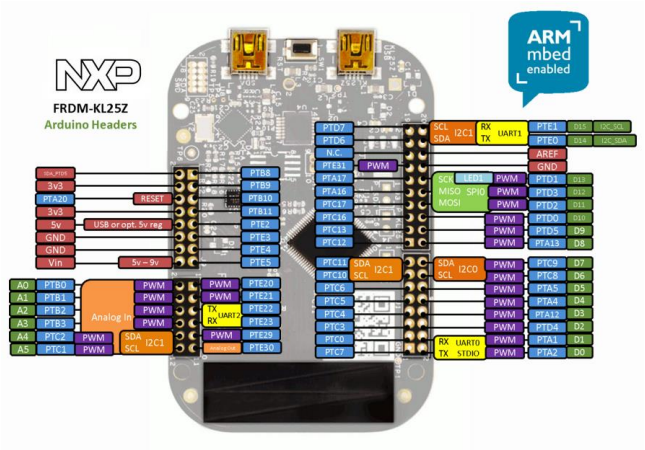

Fig -2: KL25Z board with pin description. (Source: developer.mbed.org)

The Freedom KL25Z is an ultra-low-cost development platform for Kinetics L Series microcontroller built on ARM Cortex-M0+ processor. Features include easy access to microcontroller input/output, battery-ready, low power consumption, a built-in debug interface for flash programming and run-control.

The FRDM-KL25Z is supported by a range of NXP. It also has third-party development software. To write a program it has an online developer site in which you can develop codes to burn it on this development board you can now use mbed.org at no charge, with full access to the online SDK, tools, reusable code which means no downloads.

6. ROBOTIC ARM

It is a combination of not only a particular field but a fusion of many fields such as mechanical, electrical, electronic engineering, computer science, technology, math and science. Robots are indispensable in many manufacturing industries. More than this, if it is programmed for a task then a robot perform that task repeatedly with a high accuracy that surpasses that of the most experienced human operator. To move like a human arm we need actuator to perform it like a human arm. Actuators are devices which converts the electrical energy into physical motion.

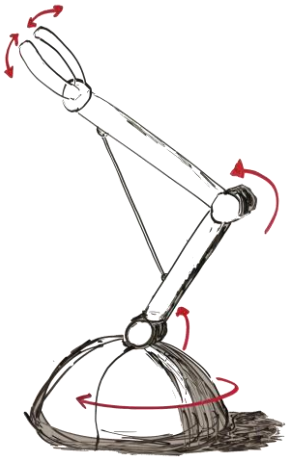

Fig -3: Structure of Robotic arm.

In this robotic arm we are going to use servo motors as servo motors gives good accuracy than any other motors. To look like a human arm we are going to connect this using servo clamps. The servo clamps are of different types, by the help of this various clamps a robotic arm is built. To pick and object and to put it from one place to another we are going to use a gripper. This gripper is also known as an end effector.

There are several types of robot arms. We are going to use 4 Degree of Freedom it can be less or more as per the requirements.

7. WI-FI MODULE

In order to communicate with the Robotic arm over the internet, we are using Wi-Fi module ESP 8266. It is a self-contained SOC and can be used with any microcontroller to access Wi-Fi network. It consists of 32 bit low powered CPU, and follows 802.11 b/g/n Wi-Fi standard. It has a powerful on board processing and storage capabilities, and is extremely cost effective.

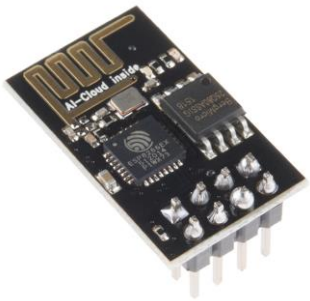

Fig- 4: ESP-8266 Wi-Fi Module.

The ESP module can be directly connected to our KL25Z board. Here we are using serial communication between ESP 8266 and KL25Z. A Wi-Fi based web server is made with a graphical user interface, and controls are given through this GUI. The signals when sent to the module can be given serially to the controller board and then to the servo motors of the robotic arm.

8. ADVANTAGES

[1]. Lifting and moving heavy objects.
[2]. Increasing productivity, safety, efficiency, and quality of products.
[3]. Achieving more accuracy than human beings.
[4]. Easy to monitor and control things.

9. DISADVANTAGES

[1]. The robot lack capabilities to respond in emergencies.
[2]. Losing security and privacy.

10. APPLICATIONS

[1]. Industrial applications – pick and place.
[2]. Third hand – The arm holds the object while operators work on it.
[3]. Small drill in manufacturing processes.

11. FUTURE SCOPE

[1]. Medical Field where minor surgeries are required.
[2]. Retrieving Suspicious objects without endangering humans.

12. CONCLUSIONS

In this project we were able to control the Robotic arm not only using the wired controls but with the help of Internet of Things which is the growing technology in recent times we successfully controlled the robotic arm using the IoT interface. This can be useful to various industrial applications where machines need to be controlled from distant places. This project not only responds to the controls sent but also records the movements and can perform the same tasks repeatedly reducing human efforts.

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