A Motion Enable Robotic ARM Controlled through a Smart Phone

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Abstract

This project is a method for controlling a Robotic arm using an application build in the android platform. The android phone and raspberry pi board is connected through Wi-Fi. As the name suggests the robotic arm is designed as it performs the same activity as a human handworks. A signal is generated from the android app which will be received by the raspberry pi board and the robotic arm works according to the predefined program. The android application is the command centre of the robotic arm. The different data will control the arm rotation.

INTRODUCTION

Robotics is one of the significant fields in the concern of industrial tradition and daily life and the robotics may upshot one variety of fields in the technological manipulations and that can be intellectual with encroachment of diverse areas like sensors, memories.

Robots are gradually being incorporated into employed task to swap humans especially to work on recurrent actions.

Robots have been with us for less than 50 years but the idea of inanimate creations represents a sincere bid whose success is much older. But real robots did not come into existence until 1950s and 60s. With the growing invention of transistors and integrated circuits, computer industry added brains to the brawn of already existing machines.

In 1959, researchers illustrated the possibility of robotic manufacturing when they unveiled a computer-controlled milling machine. Bluetooth technology was created by telecom vendor Ericsson in 1994. Android is an operating system made by Google that is open-source. With such feature, Android grows rapidly since people can develop their own applications without the burden of certain regulations. Many application developers have contributed to create applications that run on this operating system. There is one who focuses on creating the application of game, one who focuses on creating the application of social media.Usually a smart-phone is equipped with several sensors, such as accelerometer sensor.

Humans can switch job tasks easily. Robots are built and programmed to be job specific. Today's most advanced industrial robots will soon become dinosaurs.

Robots are in the infancy stage of their evolution. As robots evolve, they will become more versatile, emulating the human capacity and ability to switch job tasks easily. While the personal computer has made an indelible mark on society, the personal robot hasn't made an appearance. Obviously there's more to a personal robot than a personal computer.

PROPOSED METHOD

Without the capability of moving, an arm will be of limited use. Hence our work targets to equipped the robotic arm with motion. The project will target to develop a robotic arm which will not only have features which are demonstrated in base paper but will also have the capability of moving.
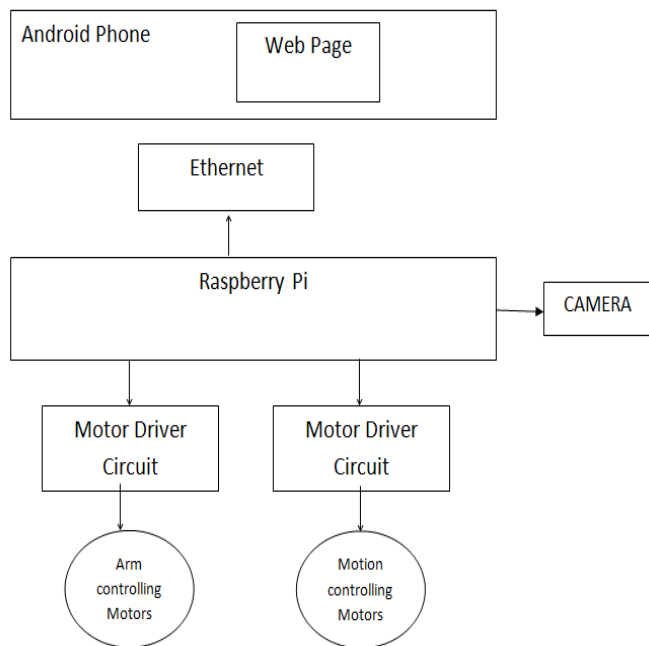
Fig.1: Proposed block diagram

The project is built using a wireless communication, which makes it very different from other Robots, The android phone and raspberry pi board is connected through Ethernet and camera. As the name suggests the robotic arm is designed as it performs the same activity as a human handworks. A signal is generated from the android app which will be received by the raspberry pi board and the robotic arm works according to the predefined program. The android application is the command centre of the robotic arm. The different data will control the arm rotation.

A. Raspberry Pi

Raspberry pi B is a portable, powerful and minicomputer. Programmable PC that runs in open-source Robot operating system. The board consists of Video Core IV graphics processing unit (GPU), ARMv7-compatible quad-core one, 512 MB of RAM. It has a MicroSD to boot media and for persistent storage. One powerful feature of the Raspberry Pi is the row of GPIO -General Purpose Input/output pins along the edge of the board (refer Fig.1.1). These pins are a physical interface between the Pi and the outside world. At the simplest level, these are called as switches.

Seventeen of the 26 pins are GPIO pins; the others are power or ground pins.

B.USB Camera

The type of camera used here is an USB camera which has recording function built-in and can thus record directly to any standard storage media, such as SD cards, NAS (network-attached storage) or a PC/server. The camera feeds or streams its image in real time to a computer or a mobile using network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via Wi-Fi. When sent to a receiver side, the video stream is saved in cloud.

C. Wi-Fi

Wi-Fiis a technology that allows electronic devices to connect to a wireless LAN (WLAN) network, mainly using the 2.4 gigahertz (12 cm) UHF and 5 gigahertz (6 cm) SHF ISM radio bands. A WLAN is usually password protected, but may be open, which allows any device within its range to access the resources of the WLAN network.

D. L293D Motor driver

This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking. The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heat sinking.

E. DC MOTOR

A DC motor is an electric motor that runs on DC electricity. It works on the principle of electromagnetism. A current carrying conductor when placed in an external magnetic field will experience a force proportional to the current in the conductor.

F. LINUX Operating system

Linux or GNU/Linux is a free and open source programming working framework for PCs. The

working framework is a gathering of the fundamental guidelines that tell the electronic parts of the PC what to do and how to function. Free and open source programming (FOSS) implies that everybody has the flexibility to utilize it, perceive how it works, and changes it.

G. QT EMBEDDED FRAME WORK

Qt is a cross-stage application system that is generally utilized for creating application programming with a graphical UI (GUI) (in which cases Qt is delegated awidget toolbox), and furthermore utilized for creating non-GUI projects such ascommand-line devices and consoles for servers. Qt utilizes standard C++ however makes broad utilization of an uncommon code generator (called the Meta Object Compiler, or moc) together with a few macros to advance the dialect.

WORKING PRINCIPLE

In this project, we are giving the complete description on the proposed system architecture. Here we are using Raspberry Pi board as our platform. It has an ARM-11 SOC with integrated peripherals like USB, Ethernet and serial etc. On this board we are installing Linux operating system with necessary drivers for all peripheral devices and user level software stack which includes a light weight GUI based on XServer, V4L2 API for interacting with video devices like cameras, TCP/IP stack to communicate with network devices and some standard system libraries for system level general IO operations. The Raspberry Pi board equipped with the above software stack is connected to the outside network and a camera is connected to the Raspberry Pi through USB bus.

The architecture of the web server has the following layers.

- In the lower level the web server has the physical hosting interfaces used for storing and maintaining the data related to the server.
- Above the Physical hosting interface the server has HTTP server software and other web server components for bypass the direct interaction with the physical interaction with the lower levels.
- The final layer has the tools and services for interacting with the video streams which includes the Image codec and storing interfaces, connection managers and session control interfaces etc.
- After connecting all the devices power up the device. When the device starts booting from flash, it first load the linux to the device and initialize all the drivers and the core kernel. After initialization of the kernel it first check weather all the devices are working properly or not. After that it loads the file system and start the startup scripts for running necessary processes and daemons. Finally it starts the main application.

When our application starts running it first check all the devices and resources which it needs are available or not. After that it check the connection with the devices and gives control to the user.

RESULTS

(a)Holding the Target

(b) Move2 of the Target

(c) Target Moved to the Destination
Fig.4: Motion of Robotic Arm

ADVANTAGES

- Low support cost, easy to implement and low power consumption and controlling is done by using web technology.
- Avoid unplanned lab operation interruptions.
- Increase laboratory efficiency.
- Remotely track critical system parameters.

FUTURE SCOPE

- The cost of ARM11 is more that's why in future we can implement this system using ARM CORTEX A8, Beagle bone etc as well as updated processors with high frequencies will work fine.
- As the storage space is also less in future we can also record these live streaming data by connecting external memory storage.
- We can complete our project using wireless technology.
- In future we can provide more security to data by using encryption, decryption techniques.

CONCLUSION

The project **"A Motion Enable Robotic arm Controlled through a Smart Phone"** has been successfully designed and tested. It has been developed by integrating features of all the hardware components and software used and tested.

Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.

Secondly, using highly advanced ARM Cortex A8 Processor board and with the help of growing technology the project has been successfully implemented.

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