

Wireless Voice Controlled Fire Extinguisher Robot

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Abstract: A voice recognition unit built around a high speed processor that ensures various operations of the system to be performed by voice command. The vehicle is controlled through user voice command. The voice input allows a user to interact with the robot which is familiar to most of the people. It can also sense the temperature which has self-defensive ability so that there will be no more harm to the robot. The advantages of speech activated robots are hands-free and fast data input operations. The voice commands navigate the robot in the required direction and the outlet of the water pump can be controlled by our voice. The medium of interaction between humans and Robotic Vehicle is through a Linux based ARM board in which the voice commands are trained using open source voice recognition algorithm. This Robotic vehicle can be used in rescue operations during fire accidents where the possibility for service men to enter the fire prone areas is very less.

Keywords: Raspberry, RF, LM35, ARM.

I. INTRODUCTION

Fire extinguishing robotic vehicle which can be controlled wirelessly through RF communication. The proposed vehicle has a water jet spray motor which is capable of sprinkling water. A voice recognition unit built around a high speed Processor that ensures various operations of the system to be performed by voice command. The Program of the project is written in C++ language for controlling robot motor from the raspberry pi through wireless data transmission protocol. The Program accepts the voice input, analyzes the speech data using pocket sphinx speech recognition algorithm and output the command through RF modules, to control the movement of robot wirelessly within 500m range using 433 MHz RF frequency. The special feature of our project is that our C++ program based voice recognizing software. So for controlling any movement of robot we have to just speak name of movement. The pocket sphinx voice recognizing software compare the user input speech with already trained words, if match found, the master system will transmit the control command to robot, else the system will process next Speed. At the receiver side of robot 8051 microcontroller is also used. The microcontroller takes command wirelessly transmitted by raspberry pi board. The role of microcontroller is to drive DC motor connected to L293D Drivers, take input from temperature sensor, fire sensor and IR sensor and transmit the data to the master which will analyze the information and act accordingly.

II. SYSTEM ARCHITECTURE

A. System Algorithm

Linux based raspberry pi module as shown in Fig.1 will be very efficient to overcome the requirement. There are many Linux based OS and among them Raspbian is sufficient for

my research work and has some advantage to use this. Raspbian is user-friendly. For a beginner it is an absolute test. It is both official and user contributed. It has wealth of documentation and also has many more features. The software is used to design a speech browser is QT creator which is used to make efficient GUI application. Qt Creator is a good example of an application that mixes different user interface technologies. In fact, it uses all of the three different approaches described below. Qt Creator uses the traditional Qt Widgets such as menus and dialogs as a basis of the user interface, Qt Quick amongst others for the welcome screen, and QtWebKit for presenting the Qt reference documentation. Qt Creator includes a project manager that uses a cross platform project file format (.pro). A project file can contain information such as what files are included into the project, custom build steps and settings for running the applications. Qt Creator includes a code editor and integrates Qt Designer for designing and building graphical user interfaces (GUIs) from Qt widgets as shown in Fig.2. The code editor can parse code in C++ and QML languages.

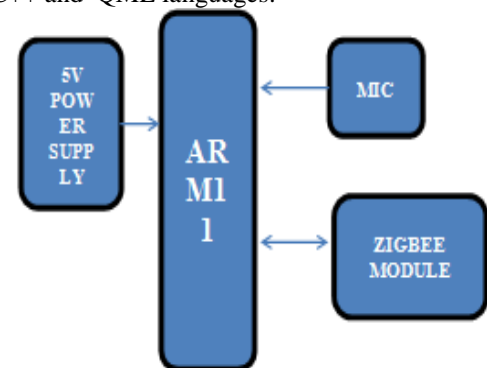


Fig.1. Master section.

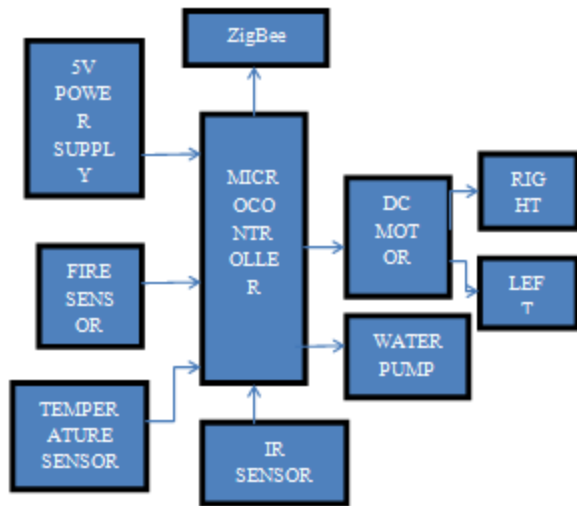


Fig.2 Slave section.

III. IMPLEMENTATION

A. Hardware

Raspberry Pi (ARM 11): The Raspberry Pi is a credit-card sized computer that plugs into your TV and keyboard. It is capable for little projects, and for many of the things that your desktop PC does, like spreadsheets, word-processing and games. It also plays high-definition videos. We want to see it being used by kids all over the world to learn how computers work, how to manipulate the electronic world around them and, how to program. The original Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SoC), which includes, Video Core IV GPU, RAM of 512 MB. The system has Secure Digital (SD) socket for boot media and persistent storage. ASoC consists of the hardware, described above, and the software controlling the microcontroller, microprocessor or DSPcores, peripherals and interfaces. The design flow for Soc aims to develop this hardware and software in parallel as shown in Fig.3.



Fig.3. Raspberry Pi Board.

Zigbee: Zigbee is a low-cost, low-power, wireless mesh networking standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries and the mesh networking provides high reliability and larger range. Zigbee has been developed to

meet the growing demand for capable wireless networking between numerous low power devices. In industry, Zigbee is being used for next generation automated manufacturing, with small transmitters in every device on the floor, allowing for communication between devices to a central computer. This new level of communication permits finely tuned remote monitoring and manipulation.

LM35: LM35 series sensors are precision integrated-circuit temperature sensors whose output voltage is linearly proportional to the Celsius temperature. The LM35 requires no external calibration since it is internally calibrated. The LM35 does not require any external calibration or trimming to provide typical accuracies of $\pm 1/4^\circ\text{C}$ at room temperature and $\pm 3/4^\circ\text{C}$, over a full -55 to $+150^\circ\text{C}$ temperature range. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only $60 \mu\text{A}$ from its supply, it has very low self-heating, less than 0.1°C in still air.

B. Software

The software is used to design and developed is QT creator which is used to make efficient GUI application. Qt Creator is a good example of an application that mixes different user interface technologies. In fact, it uses all of the three different approaches described below. Qt Creator uses the traditional Qt Widgets such as menus and dialogs as a basis of the user interface, Qt Quick amongst others for the welcome screen, and QtWebKit for presenting the Qt reference documentation. Qt Creator includes a project manager that uses a cross platform project file format (.pro). A project file can contain information such as what files are included into the project, custom build steps and settings for running the applications. Qt Creator includes a code editor and integrates Qt Designer for designing and building graphical user interfaces (GUIs) from Qt widgets. The code editor can parse code in C++ and QML languages... It is possible to compose and customize the widgets or dialogs and test those using different styles and resolutions directly in the editor. Widgets and forms created with Qt Designer are integrated with programmed code, using the Qt signals and slots mechanism.

C. Raspbian Operating System

Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi. The initial build of over 35,000 Raspbian packages, optimized for best performance on the Raspberry Pi, was completed in June of 2012. However, Raspbian is still under active development with an emphasis on improving the stability and performance of as many Debian packages as possible. The Raspberry Pi primarily uses Linux kernel-based operating systems Raspbian (recommended) – Maintained

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independently of the Foundation; based on ARM hard-float (armhf)-Debian 7 'Wheezy' architecture port, that was designed for a newer ARMv7 processor (or one with Jazelle RCT/ThumbEE, VFPv3 and NEON SIMD extensions built-in) whose binaries would not work on the Raspberry Pi, but Raspbian is compiled for the ARMv6 instruction set of the Raspberry Pi making it work but run more slowly. It provides some available deb software packages, pre-compiled software bundles. A minimum size of 2 GB SD card is required, but a 4 GB SD card or above is recommended. There is a Pi Store for exchanging programs. The Raspbian Server Edition is a stripped version with other software packages bundled as compared to the usual desktop computer oriented Raspbianand reversal protocol.

IV. IMPLEMENTATION RESULTS

Implementation results of this paper is as shown in bellow Figs.4 to 6.

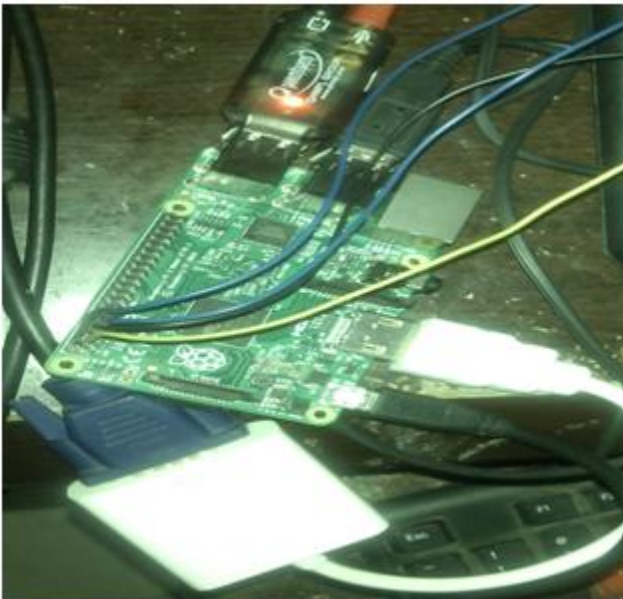


Fig.4 Master section Hardware assembly.

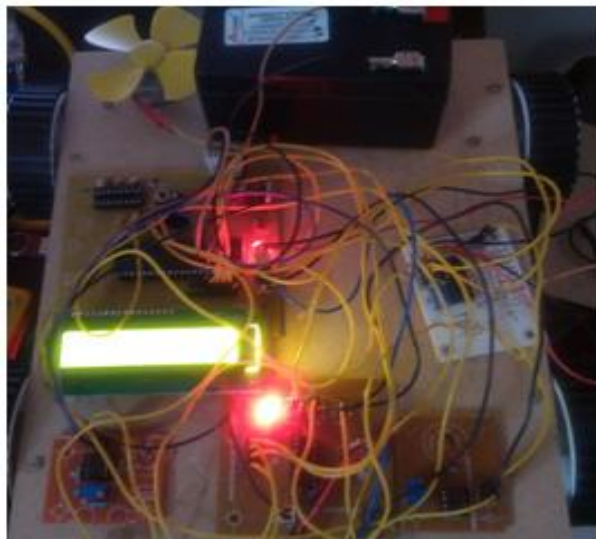


Fig.5 Slave Section Hardware assembly.

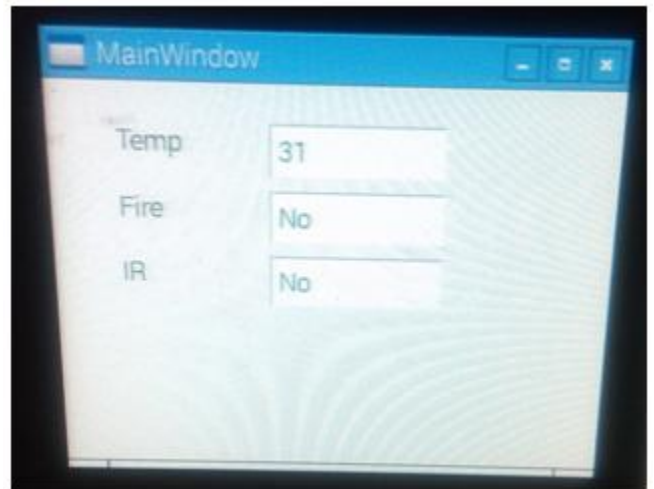


Fig.6. Values over desktop.

V. CONCLUSION

A project on building a fire-extinguishing robot that can be controlled through our voice. The robot consists of a flame sensor to detect flame and a speech recognition module to provide the necessary voice commands for the movement of robot to fire location.

Future Scope: Speech has difficulties to be recognized by an application. Because speech is different for every speaker, May be fast, slow, or varying in speed. May have high pitch, low pitch, or be whispered. Have widely-varying types of environmental noise, in future these can be overcome by using high condensed microphones and using internet technology we can increase the accuracy of the detection and range of operation.

VI. REFERENCES

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