

Smart Phone Controlled Two Axes Robot for Video Surveillance Using Wireless Internet & Raspberry Pi Processor

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Abstract— A Fabricated Robot used for Video Surveillance which can be controlled using Wi-Fi, a Raspberry Pi. At the same time, the need to observe more and more people, places, and attached with a desire to pull out of things more useful information from the video data, the spread of using embedded systems is motivating the new demands capabilities and capacity. These demands are higher than the facilities with compared to traditional analog video surveillance systems. Basically, Data Mining and Machine Learning Techniques are in the process usage of video surveillance for collection of digital data and analyzing using Matlab and other technologies. This paper gives a peculiar approach towards video surveillance system.

Keywords— Robot, Raspberry Pi, Wi-Fi, Data Mining, Machine Learning.

1. INTRODUCTION

The project is mainly designing a two axes robot which is controlled by a smart phone(android) over Wi-Fi technology. The movement of the robot can be done in all four directions (front, back, left and right) by using an Android application which has pre-assigned keys. The video surveillance is done by robot vehicle which a USB interfaces along with arm 11 processor in the Kit provided.

The innovation of the emerging high-speed technologies and increasingly growing computer capacity provides a wide range of realistic prospect for the robotic controls and for the understanding of new methodology of control theory. This technology has developed in conjunction with the need for high performance robots created faster, more accurate and more intelligent robots using new control devices, new equipment, new drivers and advanced organized algorithms. In this project, a new economical solution of robot control systems explains the system of robot arm can be used for advanced robotic applications.

Robotics & Automation is the most frequently used word in the field of electronics. In the recent years, revolution has been seen in active technologies for the automation. The present project is commonly known as Raspberry Pi processor an onboard computer and its use. The output and input modules can be used to communicate effectively with the board computer. The credit card-sized Raspberry Pi single-board computer developed in the UK by the Raspberry Pi Foundation. Raspberry Pi is an ARM1176JZF-700 MHz processor, a video in which has main part of the system which contains core IV GPU with Broadcom system BCM2835, and after the upgrade to 512 MB RAM 256 megabytes was shipped along with

it. It also has a built in either hard disk drive or solid state drive can use a SD card for booting and storage of the memory.

2. BACKGROUND

Evolution of Surveillance

The usage of video surveillance from decades as prevention to crime such as theft, fraud & violence actions. Over the past ten years, the intelligence. The technology has been developed to not only help companies to identify and to respond to threats in advance, but also helps them to focus on business development Operations. Three generations of surveillance is often described as:

- Analog
- Digital
- Smart or clever

We will explore each of these in greater detail to help you better understand. In today's environment, where we arrived at and we plan to go in the future.

Analog video surveillance

Video surveillance is usually involved in the placement of the analog video coupled with a certain business sensitive or strategic areas of the cameras for the direct monitoring of Closed Circuit Television (CCTV). This only works as a deterrent to crime, but also to record the movement of people and property. Petrol mounts cameras such as video surveillance, mobile systems, cars, buses and trains are also often used to record the events. In addition to the high-volume storage of videotapes employing security personnel to monitor hundreds of

cameras that can be cost-prohibitive. In addition, the poor image quality of the video tape, and can deteriorate over time.

More importantly, studies have shown that sits in front of a person who is assigned to special events, many hours a day and watch a video monitor in an ineffective security system. Tests performed after only 20 minutes monitor screens, the attention of most of the people watching and analysing the has dropped well below acceptable levels. Monitoring video screens is both boring and mesmerizing. In addition, manual searches of the tapes to provide the vital information needed to assist in the investigations take a long time.

Also, the video can be seen from the end point is often the only one that is not shared. This enterprise, limited ability to distribute information throughout the can be used to reduce company-wide threats and warnings. Finally, the analog video Systems security is not to extract business intelligence from the data.

Digital Video Surveillance

Today, video surveillance has never been so great, but it assumes a new role. Digital video, IP video cameras, network video recorders emergence Web video, and video-based surveillance cameras, the user opens a wide range of applications to provide better functionality and business the value of the companies.

Digital Video Surveillance (DVS) allows clients to set up effective risk management strategies that can help manage them and taking care of business information and technology assets, and risk the dangers of things, and to access information in a timely manner.

Many companies have piecemeal solutions, and are challenged to multiple systems that do not communicate

with each other. Often, In order to allow the separation of IT and physical security companies IT Infrastructure and applications already take advantage of, Identification (ID) management and transactional systems that are already in many places. IT and physical entirely separate, disparate systems operating in security only less effective, but also more labour intensive and expensive.

Smart Surveillance

Smart surveillance, intelligent video surveillance, video analytics, intelligent and common names used to describe the concept of intelligent video analytics video cameras of applying automated signal analysis and pattern recognition and sensors, automatically extracting the "useful information", which aims to streams video from the sensor.

3. PURPOSE OF WORK

The system is the monitoring section of mobile with wireless Wi-Fi and android applications.

The Transmitter is a smart phone mobile device, which has an android application which controls the robot position mounted with a camera

The robot system initially need to pair up with mobile network using Wi-Fi, power supply unit to the robot can be switched on along with Raspberry pi from the user mobile android app can be enabled for Robot direction based controlled. The USB camera which is interfaced ARM 11 near the robot section transmits the video monitoring live directly to user mobile based on same app. The Wi-Fi network supports with duplex communication used as video monitoring and Robot controlling.

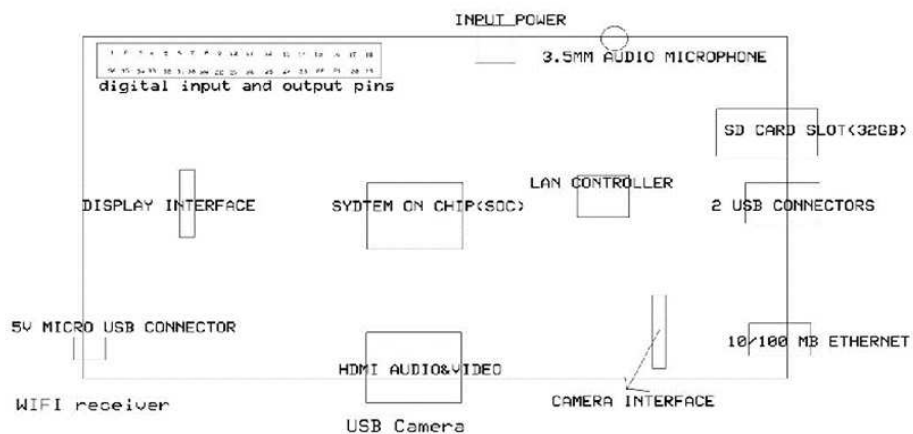


Figure 1Receiver Section of the Robot

Robot section : The entire robot is interfaced with raspberry pi processor with input output modules like USB Camera, Wi-Fi receiver/router, Audio Microphone and Robot Dc motors.

4. DESCRIPTION

Software Model:

The raspberry pi uses Linux kernel to support the operating system. The whole system software runs on Rasbian, which is done using assembly/ machine

language. The movement controls are on Graphical User Interface (GUI) on the Smart Phone.

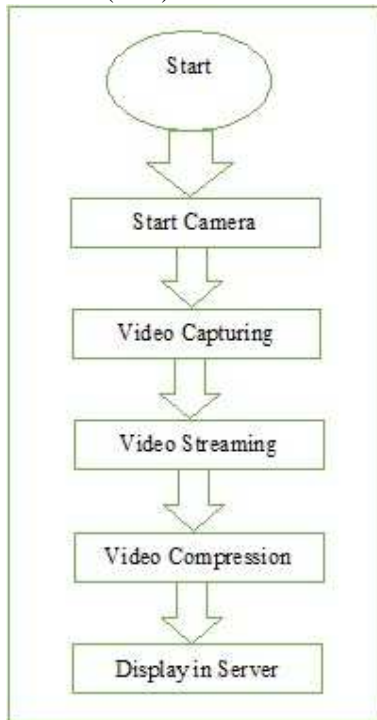


Figure 2 Flowchart of Software Design

The above figure, flow chart shows the operation of the software application used in the receiver's end using Arm11 inside the Raspberry Pi a mini computer which has an operating system controls all the applications of the embedded system.

ARM11:

ARM11 micro-controller uses ArmV6 instruction set architecture talks about wireless, consumer, networking, and addresses a wide range of applications in the automotive divisions. The media processing capability, and low-power characteristics of the wireless and consumer applications are well suited. High-performance core, coupled with the high data bandwidth, while the well-adapted for networking applications. Floating-Point products in real-time performance, and is designed to enhance the availability of the most attractive features are the high-performance automotive applications.

ARM11 cores permits consumerization to the next generation of portable and wireless applications. Each new generation of portable consumer applications are becoming more and more sophisticated. The general design requirements: a good operating system support, and support for streaming multimedia applications. At the same time, the production of low-cost, low-power, portable and wireless devices, to achieve the high-end components that are critical to ensuring the adoption for the mainstream applications.

Power Supply:

From the below figure, the power supply comes from the left hand side, which can be viewed. From Micro-USB type B slot from "miniSMD" F3 (fuse), D17 (Voltage Diode - Transient), capacitors (C2, C3, C6). +5 Voltage supply comes from USB bus Voltage.

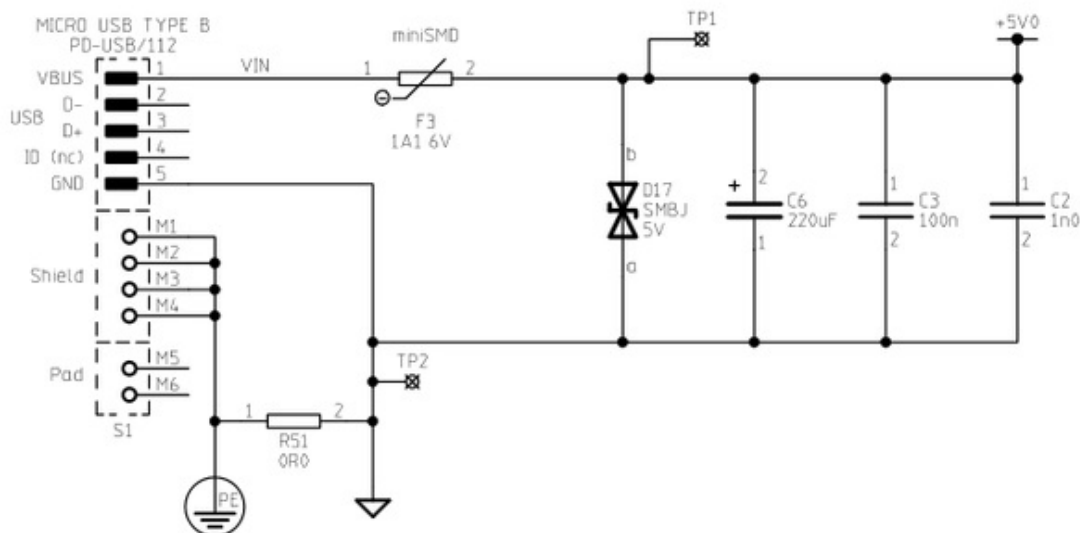


Figure 3 Power supply for Model B Raspberry Pi

The Design:

Low in cost, inexpensive.

A TVS is used to protect against over voltages and fluctuations coming from main supply (120V or 220V).

A fuse is used to protect from over current above 1Amp

USB Camera:

The USB camera is a remote webcam which is connected to Raspberry Pi, it can be viewed the recorded footage in the computer using local network. The following instructions should be followed:

- Raspberry Pi is installed with Raspbian operating system installed and internet connection can be recognised.
- Webcam is connected to the USB slot on the Raspberry Pi System.
- IP address on the LAN can be run in Cmd prompt using ipconfig.

Advantages:

1. Wireless Robot controlling to android Wi-Fi.
2. Video surveillance monitoring using android Wi-Fi
3. Low power consumption.
4. Fast response.
5. Android app developing with wireless network.
6. Usage of ARM 11 and USB camera.
7. Live video monitoring with Wi-Fi wireless communication.
8. Usage of duplex communication of Wi-Fi network.

Disadvantages:

1. Periodic monitoring of Robot with battery interfacing.
2. Interfacing of I/O devices to ARM 11 is sensitive.

Applications:

1. This project can be used in store rooms, shopping malls, hospitals, libraries etc.
2. Can be used in theatres, industries.
3. Navy n Army areas.

5. CONCLUSION & FUTURE SCOPE

This paper reviews and exploits the existing developments of robotic video surveillance systems which are used for object tracking, behaviour analysis, motion analysis and behaviour understanding. The inspiration of writing a paper on this topic is to evaluate and reach insight in visual surveillance systems from a big picture first. This project can be extended by interfacing sensors like fire, gas, human presence with audio announcements, SMS alerts to user mobile. It can also be extended using GPS module which can send the location based alerts.

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