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PIBOT: Reconnaissance and Live Streaming Frameworks utilizing Raspberry Pi

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***Abstract*—In the present world, everybody is stressed over their wellbeing because of increment in wrongdoing rate. This has prompted an expansion in the significance of a reconnaissance framework. A framework is intended for persistent checking and furthermore, the framework gives live spilling. The framework can be sent to the wherever i.e. office, house and some remote place where individuals can't screen the specific place. The framework demonstrations like a Robot inside a neighborhood through Wi-Fi innovation utilizing Raspberry pi 2 B+ model. The live gushing is refined by utilizing a webcam interfaced with Raspberry Pi, it information gave is prepared by MJPEG (Motion Joint Photographic Experts Group) streamer and the robot is controlled through site page's made. The framework is customized utilizing python programming dialect.**

Keywords*— *Raspberry Pi; PIBOT.

I. INTRODUCTION

Now a day's crime rate is drastically increased in society so, everyone concerned about their security, based on these reasons people using surveillance system. Mostly all of us using Internet Protocol (IP) based installations instead of analog system, the reason is IP based systems are affordable for the people having a low budget, we need to develop a system which is cost effective and portable [1, 2].

This paper describes the system which acts as a robot and simultaneously detects the objects or obstacle in front of it with help of ultrasonic sensor. The heart of this robot is raspberry pi model B+. To get real-time surveillance and live streaming this robot using high recourses software Python language. It makes live streaming and controlling of a robot [2,3 and 4].

The organization of this paper is structured as follows:

Section 2 gives the information about objectives of the proposed system and literature survey of the existing systems. Section 3 gives the information about functional block diagram of the system and gives the detailed information about the each and every module of the system and also it gives the information about Raspberry Pi software specifications. Section 5 shows the results and discussions. Finally, conclusion and future works can be explained in Section 6.

II. LITERATURE SURVEY

Now a day's most of the people prefer IP based installations rather than the analog. Why menace IP-based video surveillance provides better picture quality and is also beneficial in terms of scalability and flexibility [1, 4].

Smooth Security Camera using the Raspberry Pi controller and Open CV is a system developed for observation and it is designed to be used inside a warehouse facility. This framework is done utilizing a surveillance camera with night vision ability using a raspberry pi. This framework is having the capacity for human detection and smoke detection that can be utilized to keep away from potential wrongdoings and potential fire. The specialists developed a swift reconnaissance camera that has the capability of recognizing the state of the scene that is being observed and furthermore gives warning or alert as the occasion happens this framework additionally gives security amid evening as it is having the capacity to give night vision. Night vision capability is attained by simply taking off infra-red (IR) filter from an ordinary webcam and thus can be used for night vision sensing with the help of IR Light Emitting Diode illuminator [4, 5].

The system can also detect motion of an object using background subtraction algorithm. Once moving entity is diagnosed, the system can classify it as human or smoke. If smoke is detected, the system notifies in the form of alarm and through email to indicate fire or unauthorized person.

Multi-environment robot for investigation and live streaming is developed to assemble real-time surveillance system possible within a local area network. The live streaming is possible using MJPEG streamer and the server-client model is developed using Java. An IP based installation provide access from anywhere and hence are preferred than the analog system. IP based systems offer good picture quality and they are also better when it comes to scalability and tractability. But IP -based system requires some knowledge about networking and these systems are more expensive than the analog systems. This raspberry pi controlled robot is integrated by a server-client model. This client-server model is constructed on Java platform and it can work on any systems such as windows or Linux. This entire model is attached to a local area network and anyone present in that particular local network can control it from anywhere. The live streaming is done by MJPG streamer [5, 6].

The developed system capture the surrounding area with the web camera and captured data is seen in the user desktop simultaneously what is happening at present nothing but live streaming is possible with the developed system and we can control the robot with HTML pages like we can move robot forward direction, backward direction, left and right direction . if the robot wants to stop we use the STOP command. In this way we can use the proposed system and the best feature of this system is it can detect the objects and when it detects the objects automatically the robot stop its motion .with this feature we can detect the enemy and the robot is in safe condition it means we protect the system from damaging [5].

III. PROPOSED METHODOLOGY

The below figure shows the functional block diagram of the PIBOT and different modules.

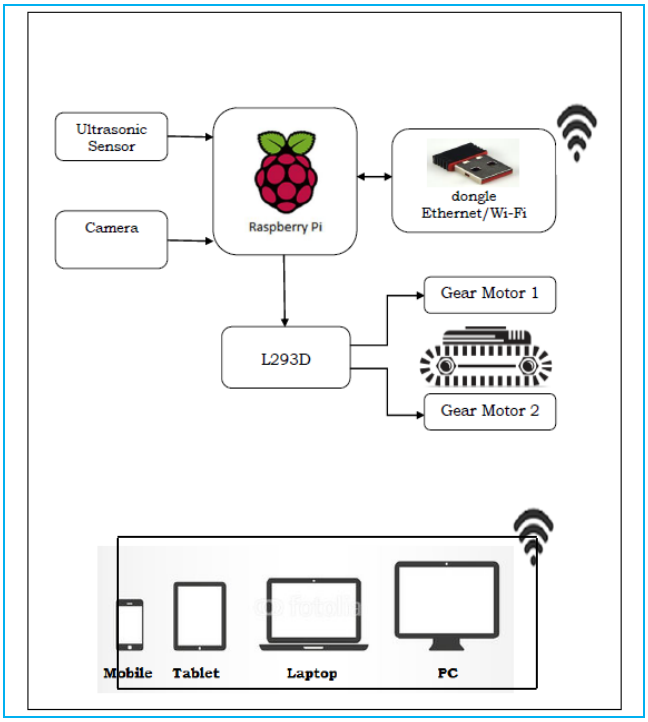

Figure 1: Functional block diagram of PIBOT

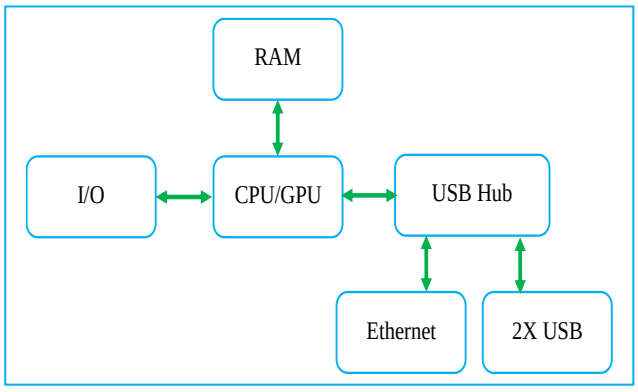

Figure 2: Schematic view of the Raspberry Pi

Basically, the raspberry pi name is derived from the fruit name raspberry. The raspberry pi is small credit card size card that exists in a single chip ,first it is developed by the United Kingdom, the below figure gives information about the raspberry pi internal architecture, with help of these blocks we can call raspberry pi is act as computer and it is having more advantages compared to the Arduino microcontroller.

The raspberry pi is available in the four models like A, A+, B, and B+, depending upon the model we are having features but in this paper raspberry pi model B+ using the advantage of taking model B+ is it is having four USB ports and memory size is high and operating frequency is also high, the CSI connector is connected to the one of the USB port.

The first developed raspberry pi is operated at frequency 700MHz and second developed raspberry pi is operated at frequency 900MHz but there is no heating problem when the clock frequency is high.

Majority of the raspberry pi chips run with clock frequency 800 MHz and some chips use the 1000MHz also in extreme cases raspberry pi run with the 1500MHz frequency also the raspberry pi run with Linux operating chips ,the raspberry pi can tolerate up to 85 °C when the temperature reaches the 85 °C we have to use the heat sinks to cool the raspberry pi for better functioning .

New versions of the firmware contain the option to choose between five overclock presets that when turned on try to get the most performance out of the system on the chip without impairing the lifetime of the Pi. This is done by monitoring the core temperature of the chip, and the CPU load, and dynamically adjusting clock speeds and the core voltage. When the demand is low on the CPU, or it is running too hot, the performance is throttled, but if the CPU has much to do, and the chip temperature is suitable, performance is momentarily raised, with clock speeds of frequency 1 GHz, depending on the individual board, and on which of the turbo settings is going to used.

In the most noteworthy preset the SDRAM clock was primarily set 500 MHz, after it is w changed to 600 MHz since 500 MHz in some cases causes SD card degradation. All the while in high mode, the center clock speed was decreased to from 450 to 250 MHz, and in medium mode from 333 to 250 MHz.

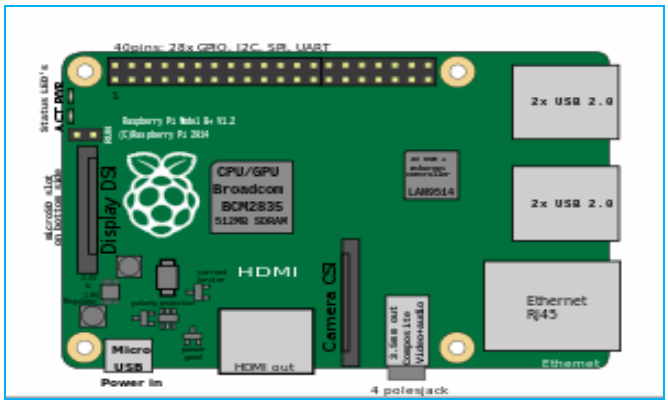

Figure 3: chip view of PIBOT

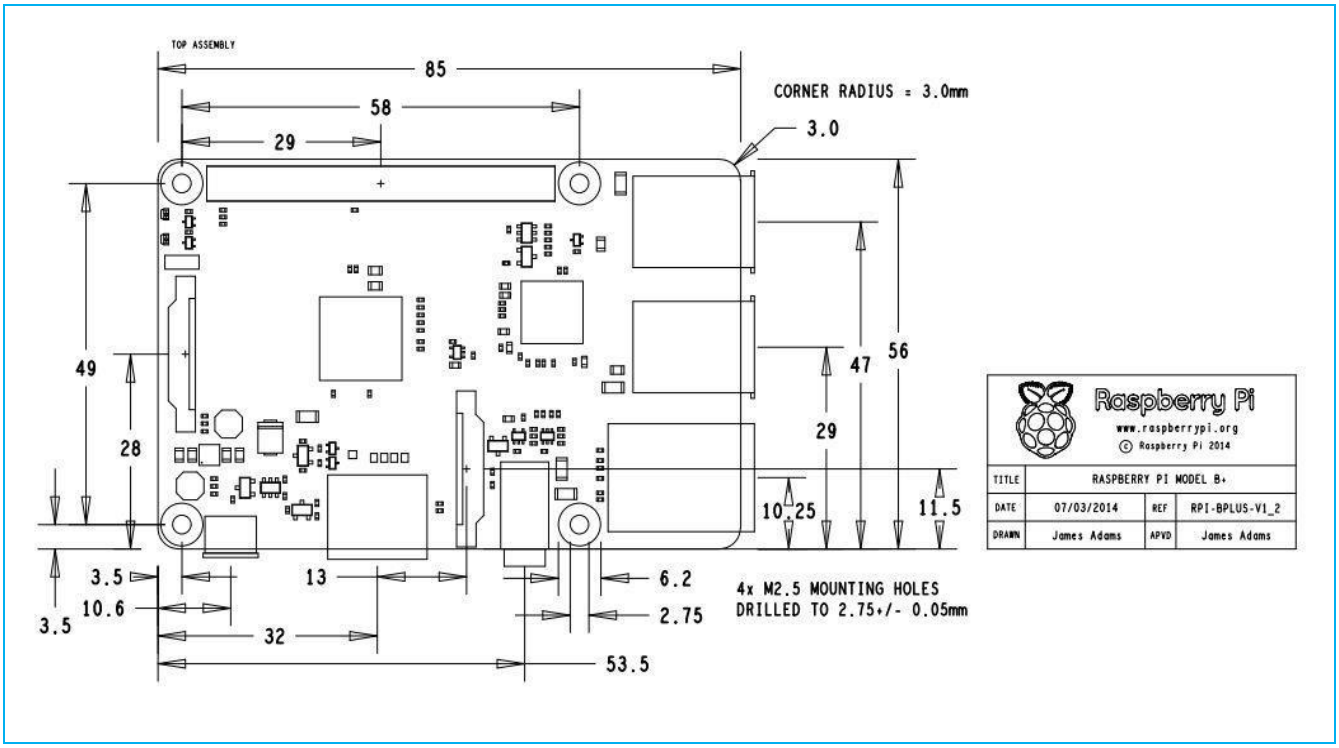

Figure 4: Internal diagram of Raspberry Pi

Raspberry Pi is a pioneering product. The number of users and fan base support the fact that the device has good future in future. The device can definitely help anyone who really interested to learn electronics and computers.

Increasing the processing power can surely help the product in the future. Also supplying a case and a proper instruction manual will improve the product. Also currently Windows operating systems are not compatible because of the ARM processor. If the processor is improved or any workaround is found to run Windows directly on the Raspberry Pi, then it can be a great step for the Pi controller.

The Raspberry Pi is an amazing bit of equipment due to the integration of the highlights of a conventional Personal Computer and an inserted device. Supporting PC working frameworks like Linux and giving basic information lines. the GPIO influences it to ideal for controlling practically anything. Programming the GPIO is very simple and natural compared to a conventional FPGA board.

At last, we can define Raspberry Pi can be effectively used if its processing power is kept in mind. It can work as a personal computer but cannot replace the original computer.

The Raspberry Pi controller is created in three board arrangements through authorized assembling bargains RS Components, and Ego man. These organizations retail the Raspberry Pi on the web. The sense of self-man creates a rendition for conveyance in China and Taiwan, which can be recognized from other Pi by their red shading and absence of FCC ID marks. The equipment is one of a kind for every one of the produces transported with 256 megabytes of RAM, later redesigned (Model B and Model B+) to 512 MB. It excludes a basic hard plate or solid state drive, yet it utilizes an SD card for booting and decided putting away, with the Model B+ utilizing a Micro SD.

The Establishment gives Debi and Arch Linux ARM transports for download. Gadgets are available for Python as the central programming dialect, with help for BBC BASIC C, Java dialects

The Raspberry Pi has a Broadcom BCM2835 assembly on a chip, which includes an ARM1176JZF-S 700 MHz processor.

Hardware Implementation

The below figure shows the hardware implementation of the PIBOT system and interfacing of the modules with RASPBERRY PI is shown in a schematic way.

In this paper, we constructed a Multi-Environmental robot using raspberry pi which in turn is used to make a real-time surveillance system possible within a local network. The live streaming is accomplished by using the MJPEG streamer. The raspberry pi has the capacity of introducing and handling high asset programming's which makes it conceivable to achieve the destinations of live spilling and controlling the robot inside the neighborhood arrange utilizing WI-FI Technology.

The methodology using in this paper is to get the full surveillance of multi-environment here Raspberry pi is using and the camera is used for surveillance and captured data is transmitted with help of Wi-Fi and that can be seen by the user personal computer or laptop. The proposed system act as a robot and this can be achieved with help of gear motors, L293D Motor driver is used as an interfacing device between the motor and Raspberry Pi.

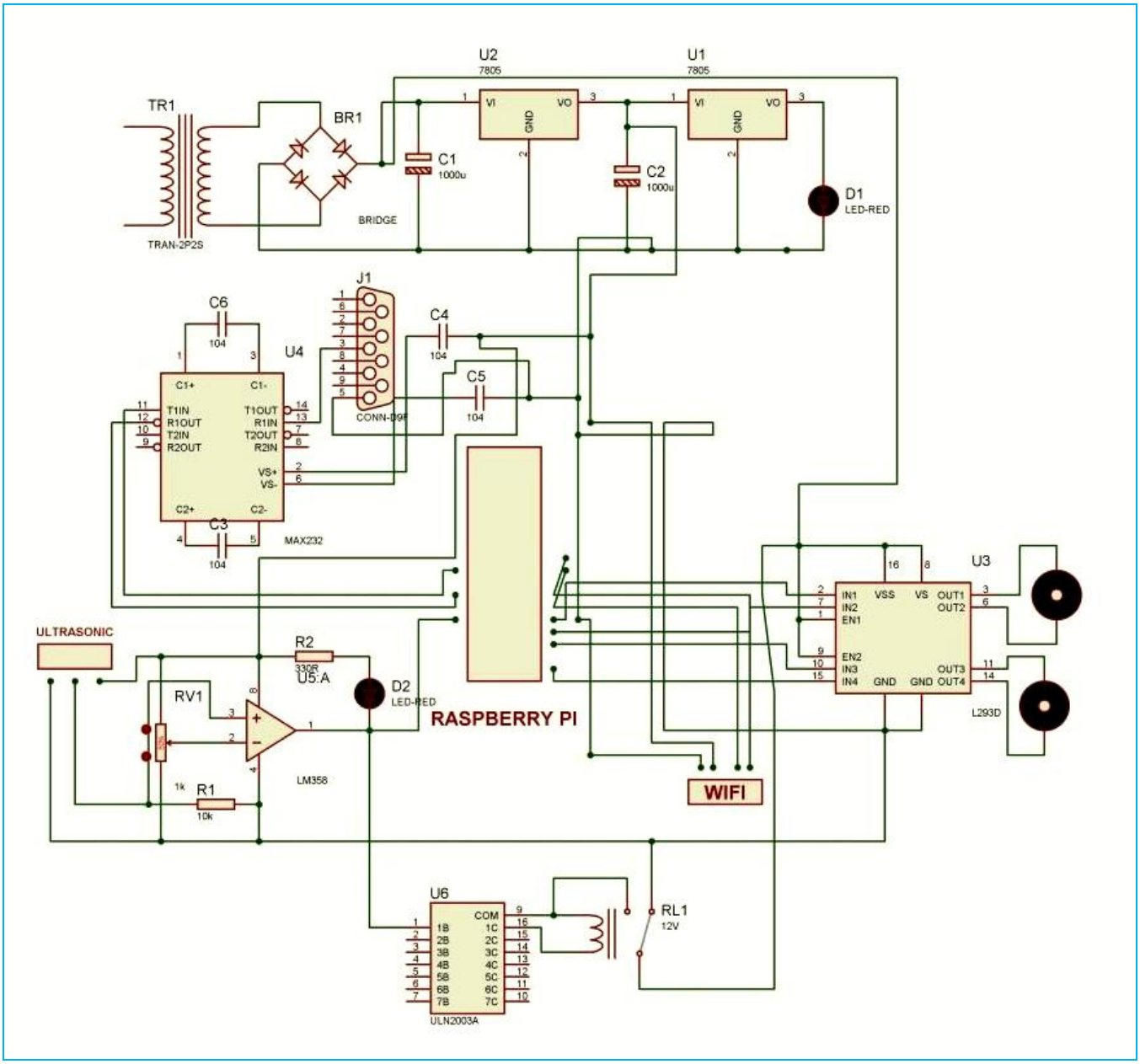

Figure 5: Schematic diagram of PIBOT

First, when the user switches on the power supply the PIBOT is similarly all modules are initiated and we have to give the 3.3Volts separately to the Raspberry Pi. The program loaded into the micro SD card and this card is placed on the Raspberry Pi micro SD card slot. The system takes some time to load the program from the micro SD card. After loading the program we have to switch on the Wi-Fi router and we should make wireless communication between the PIBOT and user monitoring device (laptop, computer, mobile phone).

When the user gives the controlling command to the PIBOT. It starts moving and the camera capture the environment and sends the information to the Raspberry Pi.The raspberry pi converts that information and sends to the user at a time when the user can monitor the live video. This system has the Ultrasonic sensor and it is used to detect the objects around 1 meter to 1.5meter distance if the obstacle is detected in that range automatically PIBOT will be turned off.

The PIBOT can be move forward, backward, left and right directions with help of DC motor this action can be achieved with help of software code. The software code is written in Python language and it is explained in software implementation

IV. Results and Discussion

The below figure 6 gives information about the overview of the robot. External power supply 5volts is given to the PIBOT and separately 3.3volts is given to the Raspberry Pi. The system has been implemented and the following results have been observed.

The PIBOT is controlled and monitored using the web page's designed. The HTML page create provides the user for controlling the robot and also live to stream.

If the user selects for the robot control, the page is directed to another page which provides controlling of the robot.

To control the robot we have to type the command raspberry pi: 5000 in user laptop or personal computer then we will get the robot control page it is shown in figure5.3. so we can control the robot in FRONT or BACK or LEFT or RIGHT side. If we want to stop the PIBOT we can click the STOP command automatically PIBOT stops its motion.

For live streaming, the user has to type the command raspberry pi: 8081 in user laptop or personal computer. The live streaming is monitored through the HTML page designed.

The below figure 8 shows the live streaming of the environment and it is monitored by the user laptop or personal computer.

Figure 6: PIBOT

Figure 7: Controlling of ROBOT through HTML page

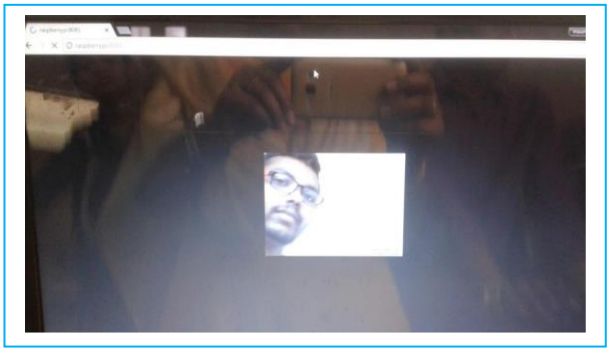

Figure 8: Live Streaming

Advantages

The following are the advantages of the proposed system

1. The system is useful for the organization where they can't afford the costly surveillance systems
2. This robot can cover the whole auditorium or big hall for surveillance
3. This robot can detect the obstacle in front of it, and the robot can be saved without damage.
4. It has all facilities and software's required for live streaming and surveillance so that user can use it without any facing problem.

V. CONCLUSION

In this present system, we have illustrated the capabilities of raspberry pi, continuous monitoring, and surveillance at sensitive areas and unreachable areas. It will be helpful to the user who needs surveillance of any place and this system provides the best results with low cost.

This system can be extended further by making the robot accessible using the internet. This can be implemented by making an android/windows and controlling of the robot is the same manner. The present system can detect the objects in front of it with help of ultrasonic sensor, we can increase the detecting range by using the advanced sensors and user wants to use the location, they can use mapping algorithm to make it map the complete environment.

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