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SPY ROBOT USING RASPBERRY PI

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ABSTRACT

In recent years, surveillance and security have become crucial areas of research. Traditional monitoring systems face challenges such as limited mobility and high infrastructure costs. This paper presents the design and implementation of a Spy Robot System **using Raspberry Pi** for real-time surveillance. The system integrates the wireless communication, camera modules, and motion control to provide remote monitoring. The proposed solution is cost-effective, highly mobile, and ideal for security applications in restricted areas. Many of the military departments now utilize the robots to carry out risky jobs that cannot be done by the soldiers. In this present work, a Raspbian operating system-based spy robot platform with a remote monitoring and control algorithm through the Internet of Things (IoT) has been developed, which will save human lives, reduce manual errors, and protect the country from enemies.

The surveillance system using the spy robot can be customized. The robot can be controlled via wheel drive control buttons. The Spy Robot System comprises the Raspberry Pi (small single-board computer), night vision pi camera and sensors.

The information regarding the detection of living objects by PIR sensor is sent to the users through the web server and The Pi camera captures the moving object, which is simultaneously posted on the webpage. The user in the control room is able to access the robot using wheel-drive control buttons on the webpage. The movement of the robot is also controlled automatically through obstacle detecting sensors to avoid collision. The surveillance system using spy robot can be customized for various fields like industries, banks and shopping malls.

I. INTRODUCTION

With rising concerns over security in sensitive areas, autonomous surveillance systems are gaining popularity. Existing CCTV-based systems lack mobility, making them ineffective in certain scenarios. This research focuses on designing a spy robot that can navigate autonomously and be controlled remotely via a user interface. The Raspberry Pi serves as serves as the system's core, managing image processing, motion control, and communication with the user. Robots can be reprogrammed faster and more efficiently. The robot has sufficient intelligence to cover the largest area to provide a secured space.

The intelligent robots can perform preferred tasks in unstructured environments with or without human direction. Real-time object detection is required because safety and security are essential in the remote monitoring and control systems such as intelligent home environments, consumer surveillance system, etc. the real-time human body detection is essential for various fields like home security systems, surveillance systems, communication systems and more. Surveillance systems are typically built using multiple cameras placed at different angles to track human objects. Particularly the tracking task is needed on cameras for dynamic objects which increase the number of cameras used in the system.

II. LITERATURE SURVEY

Sr. no	Authors and Year	Focus/Key Contribution	Technology Used	Key Findings	Disadvantages
1	Ghanem Osman Elhaj Abdalla and T.Veeramanikandasamy, 2017	Development of Raspberry Pi-based spy robot for real-time surveillance using IoT	Raspberry Pi, Raspbian OS, PIR sensors, infrared sensors, Pi Camera, Motor driver module	The spy robot can autonomously detect intruders and report to a web-based interface; capable of real-time monitoring	Not suitable for rough terrains due to wheeled mechanism limitations

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				with remote control through IoT	
2	B.R.V.Pradeep, G.Krishna Reddy, G Ravi Raju,2022.	Development of a surveillance robot for night-time remote monitoring, controlled via Android	Raspberry Pi, Night vision wireless camera,Bluetooth module, arduino microcontroller	Provides remote audio and video monitoring, capable of capturing real-time footage even in low light	Limited by Bluetooth range; Wi-Fi preferred but costly for long-range applications
3	Avinash Gudeli, Abhishek Gupta, Somdatta Sable, Kaushik Tandel, Jyoti TGurav,2022	Development of a LoRa-based surveillance robot for remote military applications	LoRa module, ESP32 microcontroller, PIR sensor, metal detector, gas sensor	Enables long-range, low-power surveillance with real-time data transmission for remote monitoring	Low data rate due to LoRa, limiting real-time data transmission speed
4	Harshita R.et al.(2018)	Surveillance robot with face recognition and alerts	Raspberry Pi 3, USB Camera	Real-tine monitoring, face recognition, live streaming, and remote control for households	Limited to indoor use; dependent on internet speed

III. METHODOLOGY

This security system project deals with the design and development of a theft control system for homes, which is used to prevent or control any theft attempt. The developed system makes use of an embedded system comprising an open-hardware microcontroller and a modem based on Global system for mobile communication (GSM) technology.

The design and developed system can be installed in the home. An interfacing intrusion detector unit is also connected to the microcontroller-based security system. The system thus incorporates a passive infrared sensor (PIR) for motion detection.

In case of an intrusion attempt, a warning message is being transmitted by the system (as and SMS) to the owner's mobile phone, or to any pre-configured mobile phone number for further processing. Improving ability for remote viewing and control. Anyone on the network can potentially see video from any camera connected to the network.

Component Selection: Choose component like Raspberry Pi, camera module, DC motors, motor driver, power supply, sensors, and GSM module.

Hardware Assembly: Mount Raspberry Pi, motor driver, and sensors on a robot chassis. Attach the camera module for video streaming.

Software Setup: Install Raspbian OS on Raspberry Pi.

Configure OpenCV for video streaming.

Write Python scripts for controlling motors, handling sensor input, and managing video streaming.

Remote Control: Setup control via a smartphone app or PC using a web interface or SSH to communicate with the robot.

Testing and Optimization: Test in different environments, refining control mechanisms and optimizing video quality and latency.

IV. SYSTEM ARCHITECTURE

The system architecture diagram represents a Spy Robot System using Raspberry Pi. Below is a breakdown of how each component interacts:

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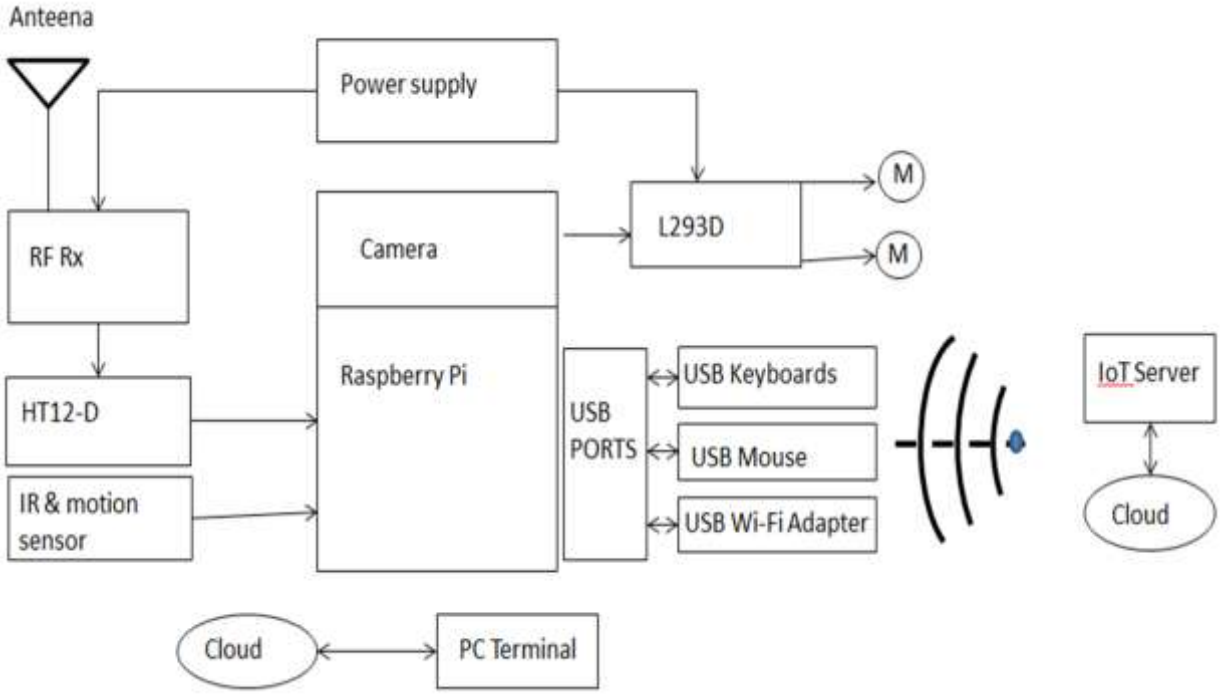
1. Communication and Sensing:

- **Antenna & RF Receiver (RF Rx):**
  - The robot receives wireless signals via an RF receiver, which is connected to **HT12-D** (a decoder IC used in RF communication).
- **HT12-D Decoder:**
  - This decodes the signals received from the antenna and sends them to the **Raspberry Pi** for further processing.
- **IR & Motion Sensor:**
  - Detects obstacles and movement in the environment.
  - Sends data to the Raspberry Pi for decision-making.



2. Central Processing - Raspberry Pi:

- Acts as the main controller of the system.
- Processes input from the **camera**, **RF module**, and **sensors**.
- Controls motor movement using the **L293D Motor Driver**.
- Connects to external devices through **USB ports**:
  - **USB Keyboard**
  - **USB Mouse**
  - **USB Wi-Fi Adapter** (for wireless connectivity)

3. Surveillance - Camera Module:

- The **camera** captures live video.
- The video feed is processed by the Raspberry Pi and transmitted wirelessly..

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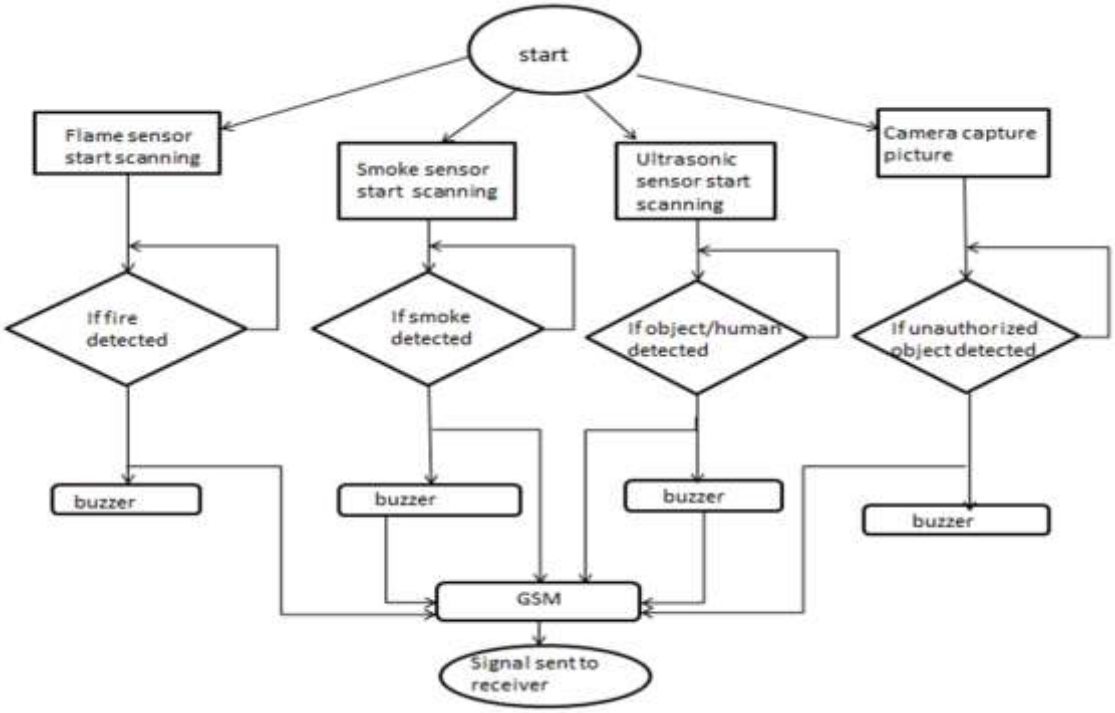
V. MODELING AND ANALYSIS



VI. CONCLUSION

The advantages of installing such a system in every household are that it provides peace of mind to the user regarding their premises, even when they are not present at home. The system's low power consumption enables easy installation in any type of household with ease. It can also be used for long duration of time by using an appropriate battery. It will allow the system to be under working condition for weeks together. Even if a security camera has already installed, this system can be added to it so that it can provide extra security.

The user will be able to keep an eye on their loved ones at home, even if they are busy working in any other place. It provides safety to elderly people and children if they're alone at home.

VII. REFERENCES

[1] Ghanem Osman Elhaj Abdalla ; T. Veeramanikandasamy presented aImplementation of spy robot for a system using Internet protocol of Raspberry Pia pubished on 15 January 2017 in 2nd IEEE International Conference on Recent Trends in Electronics, Information Communication Technology (RTEICT) which was held at Bangalore, India

[2] YungeunChoe ; Myung Jin Chung presented aSystem and Software architecture for autonomous Surveillance robots in urban environmentsa published in 2012 9th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)

[3] Avinash Gudeli, Abhishek Gupta, Somdatta Sable, Kaushik Tandel, Jyoti TGurav, 2022

[4] Harshita R.et al.(2018)

[5] Gaurav S Bagul, Vikram C Udawant, Kalpana V Kapade And Jayesh M Zope, a IOT Based Surveillance Robota, International Journal of Trend in Research and Development, Volume 5(2), (ISSN: 2394-9333) March 2017.

[6] Aishwarya K Telkar ,Dept. VLSI and Embedded systems,Visvesvaraya.

[7] Technological University centre for PG studies RO. Kalaburgi, India. Mohammad Shoeb Shah is with Electrical Engineering Department, Veermata Jijabai Technological Institute, Mumbai, India

[8] Virginia Menezes, Vamsikrishna Patchava and M. Surya Deekshith TGupta, "Surveillance and monitoring System using raspberry Pi and SimpleCV", 2016 international conference on Green Computing and Internet of Things(ICGCIoT), 14 January 2016