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Intelligent Robotic Assistant for Elderly Care and Baby Surveillance using Raspberry Pi

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Abstract: *The robot utilizes advanced sensors and artificial intelligence algorithms to monitor the health and well-being of both elderly individuals and infants.It can perform various tasks such as medication reminders, fall detection, activity tracking, and remote communication. Additionally, the robot incorporates surveillance features to monitor infants' activities and alert caregivers in case of any unusual behavior or emergencies. This innovative solution aims to enhance the quality of life for both the elderly and infants, providing peace of mind for caregivers and promoting independent living.*

Keywords: Raspberry pi,LM328 Motor driver, Ultra Sonic Sensor ,Wireless Cam

I. INTRODUCTION

An intelligent robotic assistant utilizing a Raspberry Pi can be developed for both elderly care and baby surveillance. This system leverages the Raspberry Pi's computing power and connectivity to provide features like remote monitoring, fall detection, and personalized assistance. The Raspberry Pi acts as the brain of the robot, processing data from sensors and cameras, while also enabling communication with caregivers. To be more efficient, this system uses a convolutional network to identify and interepret the baby status in his cradle. The robot can be equipped with a camera and microphone to transmit live video and audio feeds to caregivers, allowing them to monitor the elderly individual's and infants well-being remotely. Social robots can offer emotional support and companionship to elderly individuals, combating loneliness and improving their overall quality of life. The robot can track the baby's sleep patterns, movement, and other activities, providing parents with valuable insights into their baby's health and well-being.

II. LITERATURE SURVEY

R. Karthikeyan, S. Karthik, Prasanna Vishal, S. Vignesh The Paper draws a robot called snitch that is able to climb walls using microscopic suction cups, it uses the raspberry pi processor to manage the robot via WiFi network for better processing and data transport. Interruption Robots are suitable for military applications such as tracking people or places of interest, providing a dexterous advantage in hostile terrain or in undesirable situations. KunWangZhiqiangWang and Houxiang Zhang It tests the movement mechanism and crawling gait of our flexible wall-climbing caterpillar robot. The flexible climbing caterpillar robot is inspired by the genetics of the coherent caterpillar. Two different types of modules are used, the connection module and the generic module, which have been developed. Due to predefined constraints between the inhaler cup and the wall, the motion of the moth robot involved in an altered genome varied from an open to a closed group and then to an ordered open group. Elliott, M., Morris, W., Jizhong Xiao

III. PROBLEM STATEMENT

- Robust Perception: The robot needs to accurately perceive and identify the target human amidst other people, obstacles, and varying lighting conditions. This requires robust computer vision or other sensing techniques to distinguish the target from the surroundings.
- Dynamic Tracking: The robot must be able to track the target's movements in real-time, even if the target changes speed, direction, or gait. This necessitates sophisticated algorithms for motion prediction and adaptation.
- Navigation and Path Planning: The robot needs to navigate through the environment while following the target, avoiding obstacles and adapting to changes in the environment's layout.

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- Human-Robot Interaction: The robot should maintain a natural and comfortable distance from the human target, avoiding being too close or too far. It should also be able to interpret and respond to basic human cues, such as gestures or verbal commands.
- Robustness and Reliability: The robot should be able to perform its task reliably in various challenging scenarios, such as crowded environments, changing lighting conditions, and unexpected obstacles. This requires robust hardware and software design, as well as thorough testing and validation.

IV. OBJECTIVE

The primary objective of this research is to develop a versatile robotic assistant capable of adapting to diverse care giving scenarios. The development of intelligent robotic assistants for elderly care and baby surveillance aims to enhance safety, well-being, and quality of life for both elderly individuals and infants. The robot will be equipped with a suite of sensors, including cameras, microphones, and proximity sensors, to perceive its environment and interact with users effectively. Advanced algorithms will enable the robot to recognize faces, track objects, and understand natural language commands.

By integrating these features, the robotic assistant aims to enhance the quality of life for both the elderly and infants. It will provide timely assistance, promote independent living, and alleviate the burden on caregivers.

Elderly Care Objectives:

- Fall Detection and Alert System: Design a system that can detect falls and alert caregivers or family members.
- Health Monitoring: Monitor vital signs, such as blood pressure, temperature, and heart rate.
- Assistance with Daily Activities: Offer assistance with daily activities, such as scheduling appointments and sending reminders.

Baby Surveillance Objectives:

- Motion Detection and Alert System: Detect motion and alert caregivers if the baby is awake or in distress.
- Temperature and Humidity Monitoring: Monitor the temperature and humidity levels in the baby's room.
- Baby Cry Detection and Alert System: Detect the baby's cry and alert caregivers.
- Sleep Pattern Monitoring: Monitor the baby's sleep patterns and provide insights to caregivers.

V. BLOCK DIAGRAM

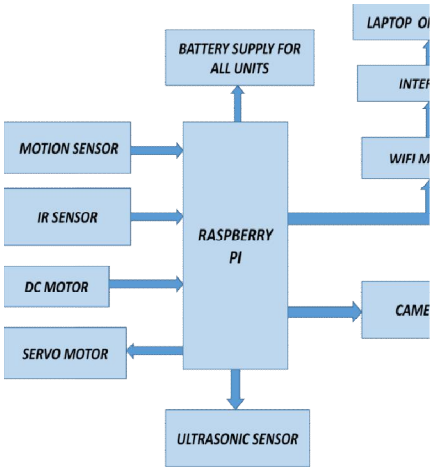

Fig.1: Block Diagram

VI. METHODOLOGY

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Firstly, the problem is identified and requirements are analyzed to understand the specific needs of elderly individuals and infants, including safety concerns such as fall detection, cry recognition, and emergency alerts. Based on these requirements, suitable Hardware components are selected, including a Raspberry Pi as the central processing unit, a camera module for video surveillance, sensors like motion sensor, temperature sensor, and humidity sensor and motors for mobility. For designing the model the hardware devices are used to make it perfectly working. All the devices are purchased from different manufacturers. These components are soldered on a soldering board.

Hardware requirements:

For designing this hardware many types of devices are used to make it perfectly working. All the devices are purchased from different manufacturers. These components are soldered on a soldering board. The following lists of hardware are required for this system.

Components Required:

- Raspberry Pi
- Ultrasonic Sensor
- IR Sensors
- L298D Motor driver
- Relay Module
- DC Motors
- Wheels
- 12 V Battery
- Few Jumper Wires

Ultrasonic Sensor:

Fig : 2

An ultrasonic sensor transmits ultrasonic waves into the air and detects reflected waves from an object. There are many applications for ultrasonic sensors, such as in intrusion alarm systems, automatic door openers and backup sensors for automobiles.

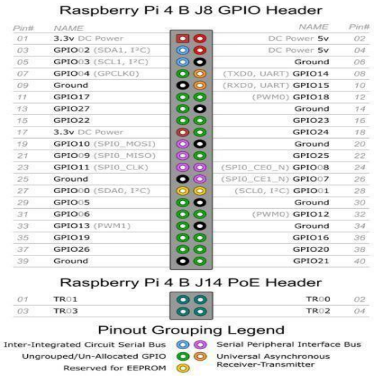

Fig : 3

Raspberry Pi

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Here is the Raspberry Pi 4 default GPIO pin out for the 40 pin J8 header. This is the configuration of the pins as you'll receive it when you first boot up Raspbian, or NOOBS with Raspbian. However, did you know that they are configurable? Yes, you can change the allocation of the Serial Peripheral Interface BUS on the pins, or decide that you don't want two Inter-Integrated Circuit (I2C) Serial BUS after all.

PWM – to control speed

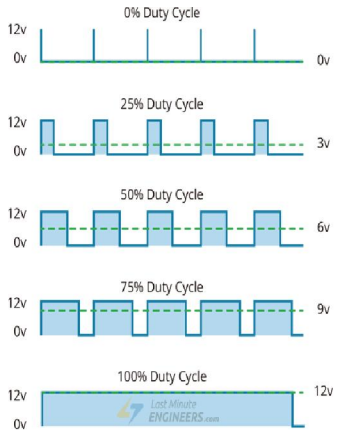
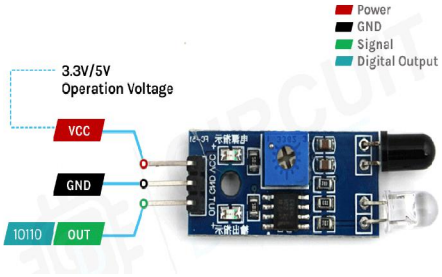


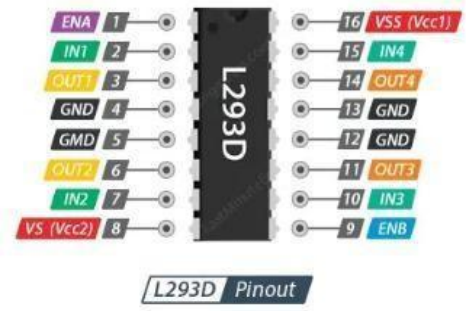
Fig :4

IR Sensor :

An infrared proximity sensor or IR Sensor is an electronic device that emits infrared lights to sense some aspect of the surroundings and can be employed to detect the motion of an object. As this is a passive sensor, it can only measure infrared radiation. This sensor is very common in the electronic industry and if you've ever tried to design an obstacle avoidance robot or any other proximity detection-based system, chances are you already know about this module, and if you don't, then follow this article as here we will discuss everything about



L293D Motor Driver IC Pin out:



Power Pins :

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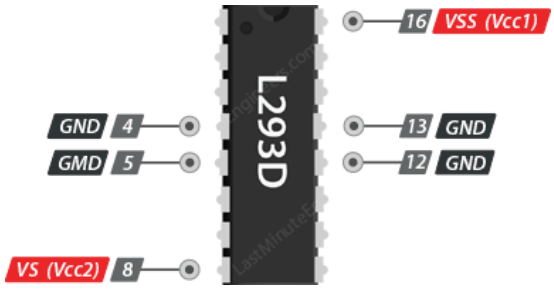
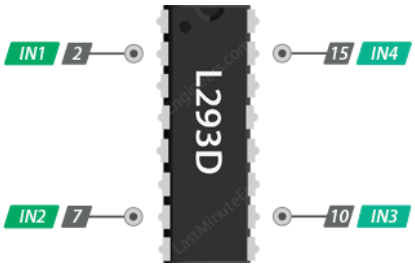
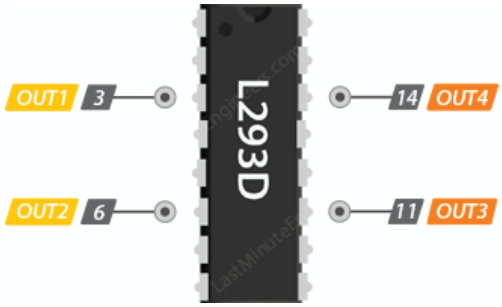


The L293D motor driver IC actually has two input power pins – VS and VSS. The IC has two direction control pins for each channel. The IN1 and IN2 pins control the spinning direction of motor A; While IN3 and IN4 control the spinning direction of motor B.The spinning direction of the motor can be controlled by applying logic HIGH (5V) or logic LOW (Ground) to these inputs. The chart below shows how this is done.

Output Pins:



Direction Control Pins:



VS (Vcc2) pin gives power to the internal H-Bridge of the IC to drive the motors. You can connect an input voltage anywhere between 4.5 to 36V to this pin.
VSS (Vcc1) is used to drive the internal logic circuitry which should be 5V.
GND pins are common ground pins. All 4 GND pins are internally connected and used to dissipate the heat generated under high load conditions.

VII. CONCLUSION

Raspberry Pi is the main functioning tool in this project. This robot has an ultrasonic sensor which detects the object and sends the information to the Raspberry Pi and motor driver which controls the process of the wheels and controls the whole operation. It will automatically be run with tracking a human. This robot is affordable but highly effective for the different purpose. The proposed system was to design and construct cost effective, reliable to follow the human and helps in many fields in carrying loads and can track the children while playing in gardens.

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