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A IMPLEMENTATION ON – SURVEILLANCE ROBOT USING RASPBERRY-PI TECHNOLOGY

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Abstract - *This paper describes a Surveillance Robot scaling horizontal and vertical surfaces while automatically controlling surface transitions, and provides the con-trolling user with surveillance of its location. Unlike other wall-climbing robots currently available using vacuum suction technique and magnetic prosthesis. The proposed model is also capable of capturing real-time images, video and audio to provide surveillance for a specific person or area. A Raspberry Pi processor is used to control the robot via a Zig-Bee network for a uninterrupted data processing and transmission. This robot is suitable for military applications like monitoring a person or area of interest, provide tactical advantage in hostile grounds or during hostage situations. It is capable of walking on any surface and providing monitoring over a area with the help of image processing which is capable to analysis and manipulation of a digitized image, video. The proposed system consist of a single unit, which will monitor the Environment for various hazardous conditions and provide video feedback.*

Key Words: — **Raspberry pi, Camera interfacing, Sensors module, face detection, server etc** .

1.INTRODUCTION

Now a days surveillance in the military areas is required but the quality of that surveillance is not up to the level of expectation. The life of the solider is in danger. So to improve the quality their should be some sort of surveillance. There should be a system which is able to mobile anywhere with effective surveillance. The surveillance can be made effective with the help of high quality video transmission. The quality of video is improved in the proposed system. These ground bot is able to move on the various surfaces such as muddy areas, staircases etc The past few years has seen a lot of technical advancements in surveillance, by the introduction of types of Closed Circuit Cameras. These have assisted in solving crime scenes and yet, the crime rate has not been reduced because of the immobility of the surveillance equipments. In hostage situations security cameras are the first to be targeted by the surveillance equipments is at high stake. This paper deals in the development of a mobile robot capable of capturing real-time images and real-time videos for surveillance. As by its name, Snitch can go beyond enemy lines to know their secrets and identities for added tactical advantage for its user. The major factor of Snitch is Mobility and it has to surpass the current hurdles in the field of mobile robotics. There was a boom in development of mobile robots and their capabilities in doing house-hold works like vacuum cleaning security door cameras to military applications like disarming explosives. BigDog robot [7] , AIBO ERS-7 [5] [6] , RoboSapien [1] are some of the mobile robots developed in the last decade they were capable of doing a specific task, but most of the robots are capable of functioning only in a controlled environment and are confined only to the horizontal surface. But some of the robots are capable of climbing on to the vertical surface like Caterpillar Robot [2], City-Climber [3], Gecko Inspired Surface Climbing Robots [4]. They use Bernoulli Effect [16], Tracked Wheel Mechanism, Electrically Controllable Adhesion technology, Electrostatic Adhesion Force [17], Aerodynamic Attraction and Vacuum suction [10] to achieve desired adhesive force to climb on vertical surfaces. But most of the robot lack the ability to transit from one dimension to the other without any human effort. The robot described here in this paper is capable of moving on both horizontal and vertical surface with ease and transit between two surfaces automatically without the need of human. To achieve hassle free mobility while performing the tasks at hand. The City Climber [3] is one of the few wall climbing robots which are capable of automatic transition between surfaces, but it uses a vacuum motor to create Aerodynamic attraction to climb on walls. This produces lots of unwanted noise, which can alert the robot's presence to all. But surveillance equipments should be more discreet or it will give away its position to anyone. This functionality is possible with the unique design of Snitch, which uses the Micro suction Cups [10] providing required adhesive force to be able to stick to the surface and also be removed with ease. So the robot produces less noise and leaves almost no trace.

2. Literature Review

R. Karthikeyan, S. Karthik, Prasanna Vishal, S. Vignesh [1] The Paper draws a robot named snitch capable of climbing wall using Micro suction Cups, it uses a raspberry pi processor to manage the robot by a Wi-Fi network for a better and uninterrupted data processing and conveyance. The robot is suitable in military applications like keeping a

track on a person or place of interest, provides skilful advantage in hostile grounds or during unwanted situations.

KunWang ZhiqiangWang and Houxiang Zhang [2] It verify the locomotion mechanism and crawling gait of our flexible wall-climbing caterpillar robot. The flexible wall-climbing caterpillar robot is inspired by the genetics of the consistent caterpillar. Two different kinds of modules are used, which are connecting module and joint module, were developed. Due to the predefined constraints between the inhalation cups and wall, the motion of the caterpillar robot engages a changing genetic set which from open group to closed group, and then to an open group orderly.

Elliott, M., Morris, W., Jizhong Xiao [3] The design obtains both fast motion of each module on uninterrupted surfaces and smooth progress between the available surface. The video also displays the eloquent simulation results of the aerodynamic tendency which has the aim to optimize the design. DSP-based control system is introduced into Surveillance Robot Using Raspberry-Pi Technology which starts the robot to operate both manually and autonomously.

Tushar Maheshwaril, Upendra Kumar, Chaitanya Nagpae, Chandrakant Ojha and V. K. Mitta15 [4] Spy-Robot which are controlled Wireless can be truly useful if they can be controlled remotely over a long distance operating ranges. Availability of multiple procedures for their wireless control operation can be improvised their capabilities and the range of applications. The paper enroots a prototype watcher that can be controlled remotely, using multiple techniques. The spy-robot can be inhabited using a smart phone based DTMF, distantly control application, audio commands and constantly changing gesture control function. DTMF uses alpha-numeric keypad of mobile phone. The remote function is developed for the Android platform based smart phone.

Rui Chen, Rong Liu, Jifan Chen and Jin Zhang [5] The paper shows the design, analysis and forgery of a quadruped wall-climbing robot. Inspired by the climbing bearing of geckos, the robot has genetics similar to a gecko's motion. Geckos stick on the wall surface with force, the robot is based on electrostatic adhesion force induced by a specially designed electrostatic adhesive footpad. By adding the bionic bearing design of the gecko and unique assets of electrostatic adhesion mechanism, the robot has profit of light weight, low power consumption, flexible movement and high versatility to different wall surfaces. Climbing practice on the surface of a high-rise glass window are exhibited, and the robot achieve the straight climbing and turning robustly and agilely.

Deepika R ,Prathyusha K ,Amulya P [6] The paper shows the framework on vision based interface that has designed to instruct a humanistic robot through gestures using image processing. Image predefining and blob detection techniques are used to obtain sign language. Then we evaluating the images to recognize the gesture given by the user in front of a web camera and take relevant movements (like clicking picture, moving bot, etc). The application is developed using Open CV libraries and Microsoft Visual C++. The movements obtained by processing the live images are used to command a humanistic robot with simple capabilities. A commercial robotic human toy robot Robosapien was used as the o/p module of the system. The robot was consolidate to computer by USB-UIRT (Universal Infrared Receiver and Transmitter) module.

Osumi H, Yokohama K, Takeuchi K, Nakamura R [7] This paper, first a method using force redundancy of the robot is been proposed for the purpose of speeding Surveillance Robot Using Raspberry-Pi Technology Synopsis up of collateral legs with the constraints due to ZMP, the limits of connecting actuators and the limits of available friction forces. Then, an algorithm for getting the fastest walking pattern in a trot gait specific time span is developed by combining the result of the collateral legs and that of the waving legs. The obtained walking stencils is installed in a quadruped robot SONY ERS-7 and its performance is varied by experiments.

S.Wu, M. Li, S. Xiao [8] The paper proposes a wireless dispersed wall climbing robot system for exploration purpose. Firstly, it introduces the work of distributed wall climbing electronic system. The mother wall-climbing robot of one single inhalation cup with two wheels loco-motion system that enables the fast motion and can accommodate nearly any kind of vertical wall surface in interrupted environment. The child wall climbing robot is inchworm-like civilized mechanical structure with the advantages of compact size and light weight, which enables the robot turn from one surface to another and can avoid exposure. Secondly, embedded bureaucrat of wall climbing robotic system is designed. With the Li-battery energy supply and wireless transmission system, robots have the calibre to explore the world semi-autonomously.

AkioY, Takumi N, Toshiro H [9] Electrostatic adhesion is evaluated for robotic wall climbing. To recognize electrostatic wall adhesion, adjustable electrodes were fabricated using plastic film and conductive foil. The wall grip performances can measured for conductive and non-conductive areas. The results for a consecutive surface revealed that, adjustable electrodes can be work as a suction cup, and that both air suction force and electrostatic force can subsidize to wall adhesion. A prototype robot using the adjustable electrodes was formulated, which could successfully climb up on a conductive wall with 6.6 mm/s.

M Fujita [10] we describe effects of human interventions with a pet-type robot in this paper, with AIBO. First, we portray a design concept for AIBO based on how the “natural" appearance can be improved. By launching statistical results of marketing and practice involving the human-robot interactions using AIBO, we show that pet-type robot launches the human feelings adequately. Furthermore, the experiments validates that AIBO helps in human-human communication. We discuss the anomaly of interaction with AIBO, and attempt to explain why this happened.

3. Mathematical model

The mathematical model is a statement of system. Using these concepts and language. A model helps to expand a system and to study effectives of different ingredient of a system to guess the behaviour of a system. The Mathematical model for this system is as follows:-

Tm + Te = Tm + Te1 + Te2 + Te3 + Tl .....(Equation [1])

Lm * Fm + Le * Fe = Lm * Fm + Le1 * Fe1 + Le2 * Fe2 + Fe3 + Ll*Fl (Equation [2])

m = motor/motor supply

e= electronic supply

T1 =sensors

l = loss

Tm = Fm * Lm = Tm * Wm .....(Equation [3])

Equation [1] it states that the power drawn from the power source must be, equal the power use by each block plus some loss.

Equation [2] it shows the same relationship, but it is broken into voltage and current.

Equation [3] shows the relationship between the voltage and current in the motor vs. the motor torque and angular velocity.

Mathematical Model for Face recognition:-

Input: - Captured Image.

Output:-Recognized Image/Detection of Attacker.

Capture image and send File to system

Let S1 be a set of parameters for Selecting File S1=(Img_Size , Img_Upload) Image Size = Actual size of file

Actual size of file.

Condition/Parameter	Operation/Function
If Image Type==Allowed	f1:Proceed()
Else ...	Discard Operation

If image type is valid then proceed Else discard operation.

Venn diagram.

Let M be the Mathematical Model which Consists of User set, Server and destination on set

M=0 (U, S, D);

U = (U1, U2, ... , Un) ||Set of users S –Server.

D- (D1, D2, D3, ..., Dn) ||Destination

Let U1, U2, U3, . . .Un be the set of capture images and then they Upload the image and send to the Destination with image.

Let D1, D2 and D3 . . . Dn be the set of Destination where image is store, and after only diagnoses attendance is increment.

S be the server, if the image is diagnoses then server will verify and update in database.

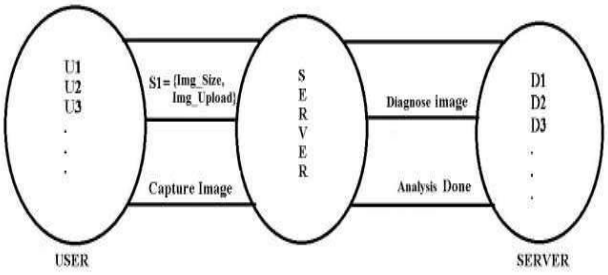

Fig -1: Mathematical Model.

4. Implementation

In the past few years everyone has seen a lot of technical growth in surveillance field, by the introduction types of Closed Circuit Cameras. These have helped in solving crime scenes and yet, the crime rate has not deducted because of the passivity of the surveillance material. In hostage situations security cameras are targeted by the felons to hide their identity. So the need for the development of mobile surveillance equipments is at stake. In existing system the Surveillance is not that effective. It only capture the real time images or videos but cannot take any actions for the suspicious activity .So for that purpose humans are send to such places hence their lives are not that secure. If in case opponent people capture our human soldier then during interrogation there are chances of disclosing the information of next mission or current mission. Again the videos images are not transmitted immediately that results in the no use of captuerd images videos. In existing system, the message transimission feature is also unavailble. So proposed system deals with the development of a mobile robot capable of capturing real-time images and videos for surveillance.This robot is capable of going beyond enemy lines to know their secrets and identities for added tactical advantage for its user. In the proposed system, the surveillance is more effective efficient.Here the images are captured by using the ipcam which is having the night vision capability. The videos will be streamed live information will be provided to the another workstation in very minute time as compared to the existing system.So humans lives will be more secure with effective surveillance.If during hostage situation, if any one caught that robot then its whole content will be erased.Hence thereby securing the information.

9. CONCLUSIONS

In this paper a variety of surveillance technique are discussed which consist of development of different robots using the raspberry-pi technology. For each of the robot detailed discussion consist of the working of the approaches which are used to fulfill requirements of the surveillance.This also includes the the advantages and shortcomings of all developed robots. Some of the techniques work only for small areas or for some specific environamental conditions which overcome by the other robots. When we come across the proposed system the

system includes the feature of the face detection which results in the implementation of the feature that is intrusion detection. The face detection algorithm works for the identification of the face that is friendly person & enemy. But this work with maximum accuracy of matching 70% of face. Overall study tells that all approaches trying to provide better result in terms of quality of the video transmission and also trying to improve the efficiency in terms of time taken by face detection algorithm & video transmission.

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