SURVEILLANCE SECURITY ROBOT WITH AUTOMATIC PATROLLING VEHICLE

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Abstract

Surveillance security robot provides safety like man. Automatic patrolling vehicle for periodic patrolling in defined or a restricted area, the patrolling vehicle can move automatically to monitor the dead zones and capture the images by using the Omni directional IPCAM, by using the internet user can monitor and control the patrolling vehicle. The position of the vehicle can be identified by using the RFID readers. The images can be transmitted to the server by using Wi-Fi system for face tracking. The MSN module sends the warning signal to the user when undefined events occur. Surveillance is the monitoring of the behaviour, activities, or other changing information, usually of people for the purpose of influencing, managing, directing, or protecting. Surveillance is therefore an ambiguous practice; this paper also presents a mobile robot design that achieves autonomous climbing and descending of stairs. The robot uses sensors and embedded intelligence to achieve the task. The robot is a reconfigurable tracked mobile robot that has the ability to traverse obstacles by changing its track configuration.

Index Terms: *RFID, Security Cams, Face Reorganization, Automatic patrolling*

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1. INTRUDUCTION

The word surveillance may be applied to observation from a distance by means of electronic equipment (such as CCTV cameras), or interception of electronically transmitted information (such as Internet traffic or phone calls). It may also refer to simple, relatively no- or low-technology methods such as human intelligence agents and postal interception.
Surveillance is very useful to governments and law enforcement to maintain social control, recognize and monitor threats, and prevent/investigate criminal activity.

However, many civil rights and privacy groups, such as the Electronic Frontier Foundation and American Civil Liberties Union, have expressed concern that by allowing continual increases in government surveillance of citizens we will end up in a mass surveillance society, with extremely limited, or non-existent political and/or personal freedoms.

An automatic patrolling vehicle acts as a security patroller in the security system, which can monitor those dead zones of the traditional fixed surveillance system. The remote monitoring capabilities can also be enhanced by using the wireless network. And the face detection system is adapted to record and analyse the invaders [1].

No matter where the user is, he can monitor the indoor status by using network. There are also many literatures concerning about surveillance issue.

2. EXISTING SYSTEM

The existing system is only for single stair surveillance, and it has some limitations while capturing the faces through the critical angle.

2.1 System Architecture

The proposed self-propelled monitoring and surveillance Vehicle can be divided into the following parts:

Wireless IPCAM video capture system, face detection system, remote monitor and alarm transmitter system, RFID position detection systems, and cell phone monitoring and control system [3]. The diagram of system architecture is shown in Figure 1. The self-propelled vehicle uses RFID technology to control the moving direction. RFID tag is installed in the right hand side of the self-propelled vehicle. When the self-propelled vehicle moves to a predefined routing path installed with RFID reader, the RFID reader would detect the RFID tag and send the signals back to the server to show the detected position on the map to indicate the status of the automatic vehicle.

Subsystem	Function Description
Wireless IPCAM video capture system	Accordance to the temporary path provided by the manufacturer to capture the pictures through w ireless I PCAM and convert into image files

Table1 1: Subsystem functional description.

Image Size	Distance between face and IPCAM	Limit of face up angle	Limit of face down angle	Limit of face turn left angle	Limit of face turn right angle
640*480	< 4.20m	30^0	15^0	30^0	30^0
320*240	< 2.25m	30^0	15^0	30^0	30^0

Table 2: The distance and image limit of face detection

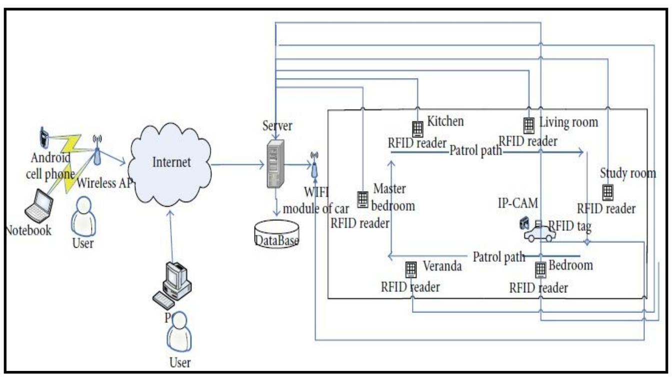


Fig- 1: The architecture of the existing system

2.2 Limitations of existing system

- Limited for only single stair
- Limited angle detection (not able to detect faces under critical angle)
- System itself having some limitations of capturing

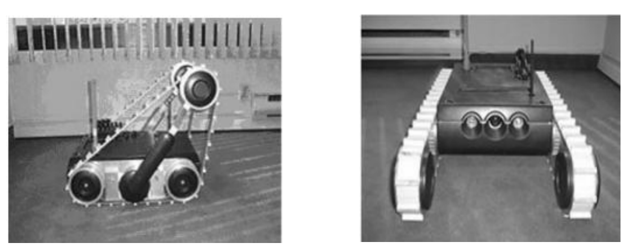
3. PRAPOSED SYSTEM

Here we are integrating surveillance robot with mobile robot design [2]. Through this we can achieve the multi location surveillance (Multiple Stairs). Mobile robots have been developed for surveillance, reconnaissance, and inspection. Some are intended to explore not only natural terrains, but also artificial environments, including stairs and ramps. Traversing such urban obstacles has been a great challenge and inevitable difficulty to the improvement of mobility and expansion of operational range of mobile robots.

Here I am integrating some of the smart techniques.

3.1 Linkage Mechanism Actuator (LMA)

Here we present the development of autonomous climbing and descending of stairs with a Linkage Mechanism Actuator (LMA) tracked mobile robot developed with Engineering Services Inc. (ESI).1 Prior to the implementation of autonomous climbing, the LMA had two modes of operation: manual and pre-programmed. In the manual mode (remote control), the operator drives the LMA directly with the use of the remote controller. In the pre-programmed mode, a trajectory can be selected, parameters entered, and the LMA will follow the path automatically. During earlier operations and demonstrations of climbing and descending of stairs, only
The manual mode was utilized. The operator navigates the LMA using the remote controller (joystick and buttons).The disadvantage of this mode is that the operator has to rely on his/her own judgment to set the robot in the right configuration in order to be able to successfully climb and, Descend stairs without overturning. In addition, effecting this operation from a remote location, based only on the view of video images, provides a serious challenge to the operator. First, the operation in manual mode is intuitive, and it would be almost impossible to ascertain stability on climbing and descent. Second, climbing and descending stairs in the manual mode requires operator's knowledge, experience, skills and training. This is not preferred since the operators may have to be replaced from time to time. It is therefore advantageous to provide a robot with autonomous climbing and descending, thereby enabling precise, faster, and safer operation while reducing the operator's load and possible damage to the equipment in cases the robot might roll off the stairs.



a) Side View b) Front View

Fig-2: Side and front views of the LMA.

3.2 Procedure for climbing and descending stairs

The schematic in Fig. 3 shows the stair profile used and some related parameters. The height of each step or riser length ranges from 12–18 cm and the width of a step range from 8–25 cm. The imaginary line connecting the stair edges is referred to as the "nose line." The slope of a nose line indicates how steep the stairs are, and its range is from 25– 45◦. Stairs with step height and width of 18 cm and nose line slope of 45◦ were used to test the LMA.

The motions required to climb stairs are broken down into three stages—the "riding on nose line," "going on nose line," and "landing" stage. Figure 3 shows each procedure to climb stairs. In the riding on nose line stage, the LMA moves forward until its front wheels are above the first step edge as shown in Fig. 3(a), (b), and (c). During the motion, the flipper is set at a certain angle (ϕ is approximately 45◦) at the front, such that some of the treads on the tracks engage onto the first step edge. The flipper is then rotated backwards until its tip - touches the ground to avoid flipping over (Fig. 3(d)), and then the LMA moves forward (Fig. 3(e)). We observed during various experiments that the COG position change during the flipper's motion between configurations 3(c) and 3(d) did not pose any flip over instability issues. At a proper time, the LMA is stopped and the flipper is extended to the rear to ride on the nose line as shown in Fig. 3(f).And directionality may be estimated (Tamura, Mori & Yamawaki, 1978). However, the problem is in identifying patterns of co-pixel variation and associating them with particular classes of textures such as ``silky, or ``rough.

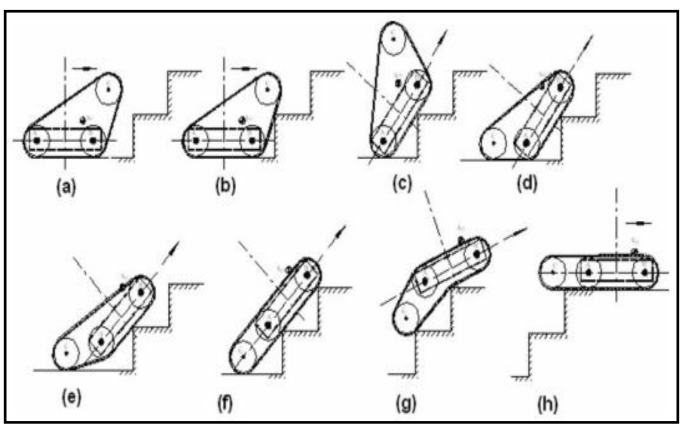


Fig- 3: Climbing and descending procedures for stairs: Climbing follows the order of (a), (b), (c), (d), (e), (f), (g) and (h); Descending follows the order of (h), (g), (f), (e), (d), (c), (b) and (a).

3.3Two Way Audio & video IP Camera

The camera which is used in existed system having complexity to identify the faces more than 30^0 inclination. Through this camera we can achieve 67^0 view images.

Features [4]

- Image Sensor: 1/4" CMOS
- High image & video quality, two-way audio monitoring
- Infrared LED: 8pcs infrared LED, automatic operate in dark environment
- Resolution: VGA (640x480)/ QVGA(320x240)/ QQVGA(160x120)
- Compression format: H.264
- Allow remote Pan/Tilt control: 350° in pan, 60° in tilt
- Motion detection to trigger alarm
- KDM-6706AL is wireless model, Wi-Fi compliant with wireless standard IEEE 802.11b/g.
- Light weight
- Omni directional coverage
- High resolution images
- Active participation in communication

Fig-4: Two way audio & video Camera

Model Number	KDM-6706	KDM-6706AL
Type	Wired	Wireless
Image Sensor	1/4" Colour CMOS Sensor	
Resolution	640*480(300k pixels)	
Lens	3.6mm/F2.4 IR glass lens at 67 degree view angle	
Video	VGA:15FPS/640*480, QVGA:30FPS/320*240, brightness, contrast adjustable	
Audio	ADPCM audio compression, built-in microphone	
Ethernet	1pc 10/100Mbps RJ45	WEP & WPA Encryption 802.11b:11Mbps(Max), 802.11g: 54Mbps(Max)
Supported Protocol	HTTP,FTP,TCP/IP,UDP,,GPRS	
P/T	350°(H) & 60°(V)	

Table-3: Specifications of Two way Audio camera

4. CONCLUSION

The proposed system is implemented on a PC server, Automatic Vehicle and some small smart systems (Two way IP cameras and mobile robot) via Networks to provide the functions of surveillance and remote control. A method of autonomous climbing and descending of stairs was introduced. Stability judgment equations were formulated and used as conditions to prevent tip-over and ensure stability of the mobile robot. The effectiveness of these equations was determined by adding margins to the range of variation of the mobile robot's centre of gravity (COG). The proposed surveillance robot using RFID technique to guide the vehicle cruising according to the pre-defined route. An f ace detection technique is adopted in this paper by using IPCAM to find out the invader. The WIFI is also applied here to not only transmit the messages from RFID reader and IPCAM or the warning messages to user but also send the remote control signals to the vehicle if necessary.

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