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Controlling Obstacle Avoiding And Live Streaming Robot Using Chronos Watch

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Abstract **– In today's world working on robots is growing fast. In this field controlling robots with remotes is a complicated part as there is a chance of confusion by the user. Instead, we can use the concept of gestures i.e. we can control the movement of robot using chronos watch and make hand movements. The users have to wear a chronos watch. The accelerometer present in chromos watch will record hand movement in specific direction and commands the robot to move in that respective direction. The robot also consists of a camera along with the watch and is connected wirelessly via radio wave which enables to interact in a more friendly way. It can also sense the obstacles and responds accordingly. The main objective is to make a simple and cheap robot which could be of help in many purposes.**

Keywords **– Chronos Watch, Obstacle Detection, Radio Waves Accelerometer, Wireless Camera.**

I. INTRODUCTION

In recent years, many efforts have been made to develop natural interfaces between users and computer based systems based on human gestures. Generally robots are electro-mechanical machines which perform tasks automatically under some guidance. They can be controlled using a remote or a computer interface. When it comes to human-machine interface, we communicate with robots based on the gestures. Gesture recognition can be considered as a way for a computer to understand the human body language.

The main motto of designing this robot is to help the disabled people drive their chairs without even having the need to touch the wheels of their chairs. Not only this, it can reduce the complexity of operating remote control based robots. For example, military, industrial robotics, construction vehicles in civil side etc. come under this category. Commands to the robot are sent by chronos watch [1, 2] depending on either Tilt control or Touch control. Once the commands are received by the receiver on robot, it processes them in order to change position or speeds. It also develops real-time obstacle detection and obstacle [18] avoidance for autonomous navigation of mobile robots using IR sensors in an unstructured environment. The process of robot control includes

- Collects information of the environment (Senses).
- Information collected is used and processed (Process).
- Follows instructions to perform actions (Acts).

In this hierarchical approach, at first robot senses the environment and collects the information and then plans the next action. Data collected will be passed to microprocessor to process those data. Obstacles surrounded by the robot can be detected by sensor installed on the robot such as infrared or ultrasonic sensor. This avoids robot collision. Camera installed on the robot can provide video feed to the user in order to perform inspection in unfamiliar area or narrow tunnel.

Controlling Robot using chronos watch:

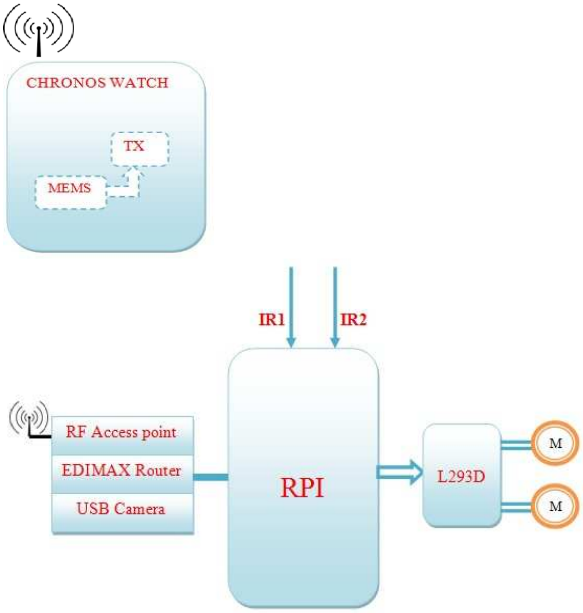

Fig. 1. Block diagram of controlling robot using chronos watch

II. HARDWARE AND SOFTWARE COMPONENTS USED

A. *Hardware Components:*

1) eZ430Chronos Watch.
2) Raspberry Pi2b.
3) EDIMAX Wi-Fi Router.
4) USB Camera.
5) RF Access point(chronos receiver)
6) IR Obstacle sensors.
7) Driver (L293D).
8) DC Motors.
9) 7805 Regulator.
10) LEDs.
11) Power bank.
12) 12 V Battery.

B. *Software Components:*

1) Chronos control center.
2) IDLE (Python GUI).
3) Raspbian OS.
4) Motion software.
5) Putty software.

III. CIRCUIT DESIGN

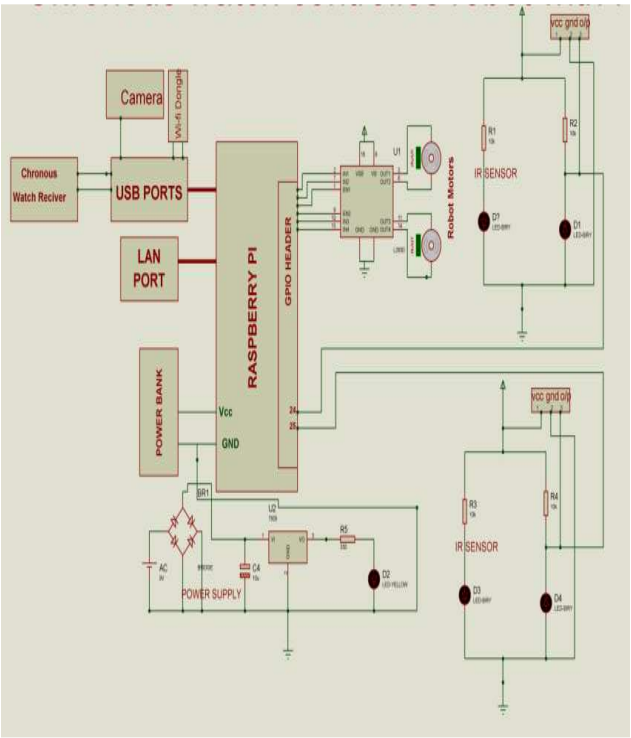

Fig. 2. Schematic diagram of controlling robot using chronos watch

Figure 2 gives the clear idea of the circuit design implemented. The signals transmitted by chronos watch [1, 2] will be received by the chronos receiver i.e. RF access point [1, 2] which is in USB mode. Raspberry Pi [14,15,16] consists of four USB ports. RF access point is connected to one of those USB ports. There is a USB camera [7] for the live streaming of robot which is connected to another USB port of raspberry pi [14,15,16, 24]. This camera passes the recorded video signals to processor. This processor gives commands to the EDIMAX (Wi-Fi router)[11,12] to transmit the video signals to surroundings which are also in USB mode. The EDIMAX [11,12] is connected to third USB port of raspberry pi [14, 15, 16, 24]. The signals from the raspberry pi [14, 15, 16, 24] are given to the motors to drive the robot. But, we get weak data signals from the raspberry pi. So, the motor driver IC (L293D) is used to boost up these weak signals such that motors drive according to the commands given by the chronos watch [1, 2]. Raspberry pi consists of 40 GPIO (general purpose Input Output) pins. Among those, pin 16 and pin 20 act as inputs to the processor i.e. these pins are connected to outputs of left and right IR proximities [20]so that commands given by IR proximities are interacted with the processor with the help of these pins. Rasbian OS [21] which is a linux based operating system is installed into the processor by using New Out Of the Box Software (NOOBS) [4]. It is used to interact with user and make changes by using putty software [8]. To make the USB camera [7] interact with processor, Motion software [13] is installed in the Rasbian OS [21] by using following commands in command prompt.

- $ sudo apt-get install motion
- $ sudonano /etc/motion/motion.conf
- $DAEMON = OFF (change to ON) and Webcam_localhost = ON (Change to OFF)
- $sudonano/etc/default/motion start_motion_daemon = no (change to yes).

IV. OPERATION OF THE PROJECT

1) The principle on which “Controlling Robot using Chronos watch” works is the principle of accelerometer. This records hand gestures and pass that data to RF access point i.e. the receiver of chronos watch [1, 2]. This receiver assigns proper voltage levels to the recorded movements. After recording the information it is transferred to a Raspberry Pi processor [14, 15, 16, 24] wirelessly via RF on the receiving end. Then information is decoded and then passed onto the microprocessor (Raspberry Pi) which takes various decisions based on the received information. These decisions are sent to the motor driver IC such that the motors are triggered in different configurations to make the robot move in a specific direction. As discussed, the robot has a capability to sense the obstacles [19] and respond to them accordingly. Commands are given by the reported results. Although not everything need be disclosed, a paper must contain new, useable, and fully described information. For example, a specimen's chemical composition need not be reported if the main purpose of a paper is to introduce a new measurement technique. Authors should expect to be challenged by processor. We applied a wireless camera which is be useful for survey purpose. This wireless camera has both transmitter and receiver and will be able to transmit the information.

A. Transmission Section:

In this project, the transmission part is through chronos watch [1, 2] which operates at operating frequency of 868 MHz. This watch consists of an inbuilt accelerometer, followed by the transmitter. Signals are transmitted by the transmitter which consists of coordinates of the chronos watch i.e. accelerometer which is inside the chronos watch.

B. Receiver Section:

As discussed above, the signals after transmitted from the chronos watch [1, 2] are received by the chronos receiver i.e. RF access point. RF access point which is in an USB mode is connected to one port of the raspberry pi board [14, 15, 16, 24]. When we run a program in the processor RPI, it gives the directions based on the coordinates transmitted from chronos watch. The signals are decoded after receiving them by receiver and then passed onto the RPI. This RPI makes various decisions based on the received information. The motor driver IC (L293D) receives these decisions. This triggers the motors in different configurations to make the robot move according to the commands given by chronos watch [1, 2] in the specified direction.

The robot has two additional features

1) It can sense the objects and responds according to the situation. For sensing the objects we used IR proximities. We have two IR sensors [17] on the either side of the

robot. When any one of the IR proximities gets high logic it means that an obstacle [23] is present. So robot moves along the opposite side of the active IR proximity. For example if the robot is moving in the forward direction, if an obstacle is on the right side of the robot then the right IR proximity gets high logic, thus the robot has to move towards left in order to avoid the obstacle. Whenever right proximity gets activated the processor (we will write the program in processor) sends the signals to the robot to move left side and vice versa. If both the sensors are active then the robot stops.

1) Robot can give live streaming [7] of the surroundings by using a USB camera [7]. The USB camera is connected to one of the ports of the raspberry pi [14, 15, 16, 24]. Whenever camera records the data it will send the video signals to processor. By using motion software which is installed in the processor these video signals are transmitted to surroundings using a Wi-Fi router (EDIMAX) which is connected to another port of the raspberry pi [14, 15, 16, 24]. Whenever this router is connected to hotspot of any electronic device (laptop, smart phone), with a working internet connection, the router generates an IP address. When we type this ipaddress:8081 in the browser's search box we get the live streaming [7] in the hotspot connected device(laptop/smart phone).

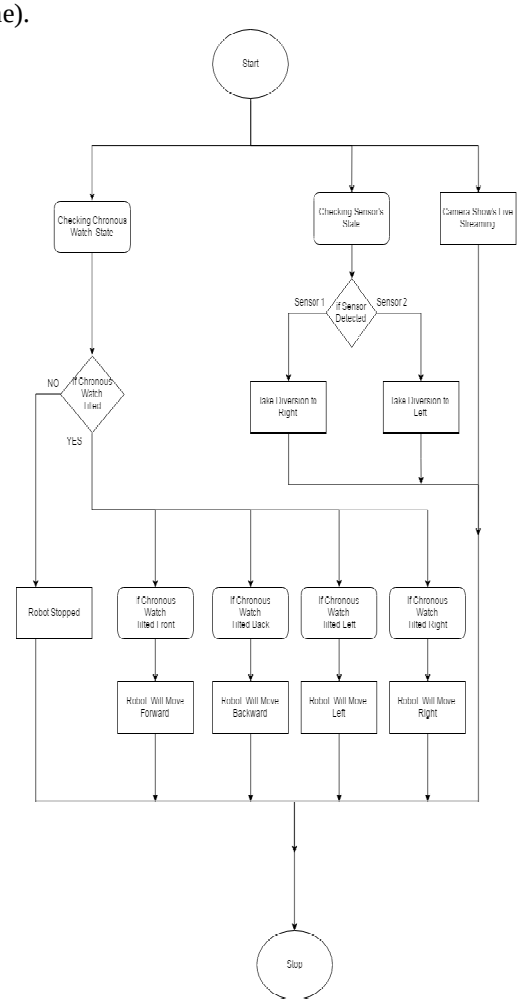

Fig. 3. Flow chart of controlling robot using chronos watch

V. EXPERIMENTAL RESULTS

In this section, we present the experimental results.

Fig (4a) shows the forward movement of robot because the command given by chronos watch [1, 2] is to move forward.

Fig (4b) shows robot taking right turn.

Actually the robot movement is forward because command given by chronos watch is to move forward. You can find an obstacle on the left side of the robot which is indicated by left IP proximity (high logic). In order to avoid the obstacle the robot takes a right turn which is done by processor.

Fig (4c) shows robot taking left turn.

Originally, the robot movement is forward because command given by chronos watch is to move forward. We can find an obstacle on the right side of the robot which is indicated by right IP proximity (high logic). So, to avoid the obstacle, the robot takes a left turn which is done by processor.

Fig (4d) shows no movement of robot.

The robot movement is forward because command given by chronos watch is to move forward. But there is an obstacle which covers the whole path of the robot not giving it a chance to move. This is indicated by both the left and right IP proximities. So, to avoid the obstacle the robot stops.

Fig (4e) shows robot giving live stream [7] of the surroundings.

Fig. (4a): Robot moving forward.

Fig. (4b): Robot taking right turn.

Fig. (4c): Robot taking left turn.


Fig. (4d): No movement of robot.

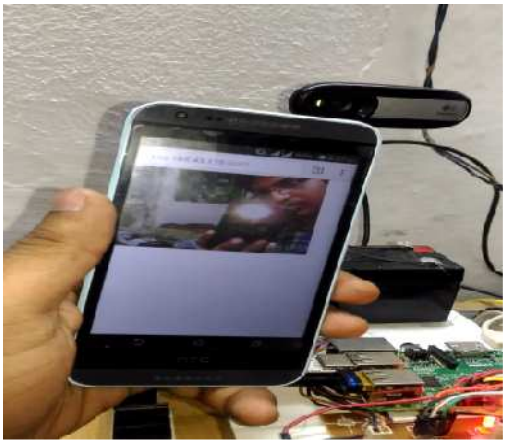
Fig. (4e): Live streaming by robot.

VI. APPLICATIONS

Controlling a robot using chronos watch [1, 2] based on gestures concept can be widely used in real life. This is useful in places where the environment is not suitable for humans. Some of the applications are

i. Industrial applications.
ii. Bomb detection.
iii. Military applications.

VII. CONCLUSION AND FUTURE WORK

From this study, a robot with camera that can be controlled using a chronos watch based on gestures has been developed. We developed the robot with a very good intelligence which is capable of easily sensing the obstacle [23] through IR sensor. We proposed a model of a robot based on "Human Machine Interfacing Device" utilizing hand gestures. By this we can communicate with embedded systems for tracking of enemies. In the end, all the objectives were successfully met and an autonomous robot with vision based obstacle avoidance capability is designed and implemented on a Raspberry PI [14, 15, 16, 24]. In future, we can either use some alternative power source for the batteries or replace the current DC Motors with the ones which require less power. And also as the robot moves on the flat surface, we can also fly the robot in the sky

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