

# **EL213 - ANALOG CIRCUITS**



## **PROJECT REPORT**

**PROJECT TITLE** : MOTION ACTIVATED WILDLIFE RECORDING CAMERA

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## **Preface**

Motion Activated Wildlife Recording Cameras are intended to be mounted in the wild, hidden from view if necessary, where they can be set to capture still images at specific intervals or video when they detect motion. The cameras can be left in place for months with the hopes of capturing some unique images. Many rare creatures have been documented using wildlife cameras.

Through our project, we have taken an initiative to make one such camera using a Raspberry pi , a USB webcam ,a PIR motion sensor, a handful of other parts and couple of Python programs . This camera will record short videos when some sort of motion is detected by the sensor.

Further we have also suggested some improvements which could have been done if there were no budget and time constraints.

## **Acknowledgment**

We wish to express our sincere gratitude to **Prof. Rutu Parekh** for providing us an opportunity to do a project on “Motion Activated Wildlife Recording Camera” in this course. Without her active guidance, help and encouragement we could not have done justice to this project.

We would like to extend a sincere & heartfelt obligation towards all the personages who have helped us in this endeavor. Especially, to the Teaching Assistants who have helped us and cooperated with us so that we could make a headway in the project.

We are also thankful to our seniors who took out some time from their busy schedule and shared their own experience when they had taken up a similar project in this course a few years back.

***‘It is not possible to prepare a project without the assistance & encouragement of other people. This one is certainly no exception.’***

Thanking You

Group-24

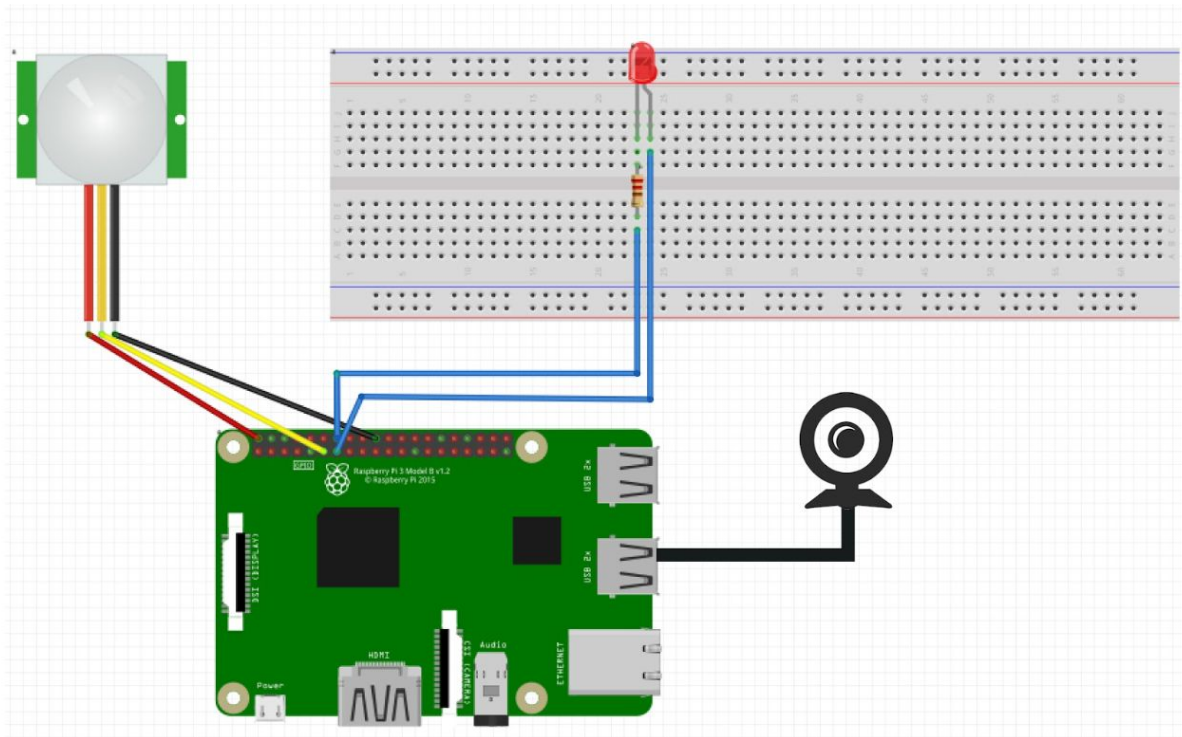
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## **Project Objective**

Our aim is to devise a circuit with the help of Raspberry pi that would capture pictures and take video recordings on detection of motion within a specific range.

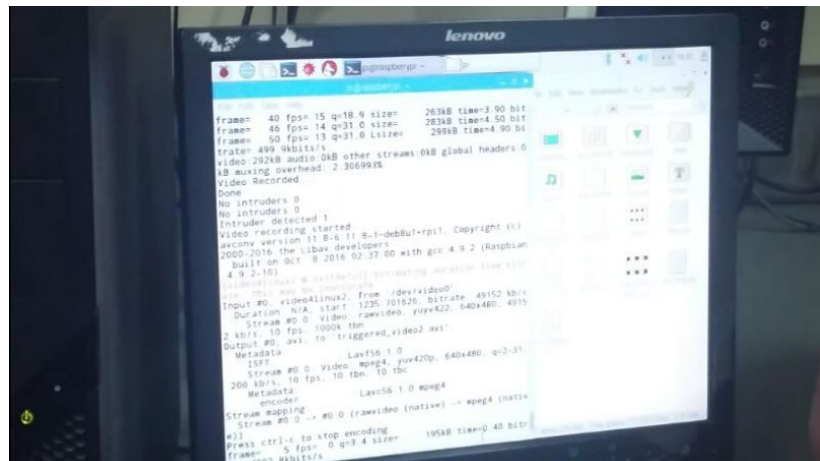
## **Circuit Diagram**

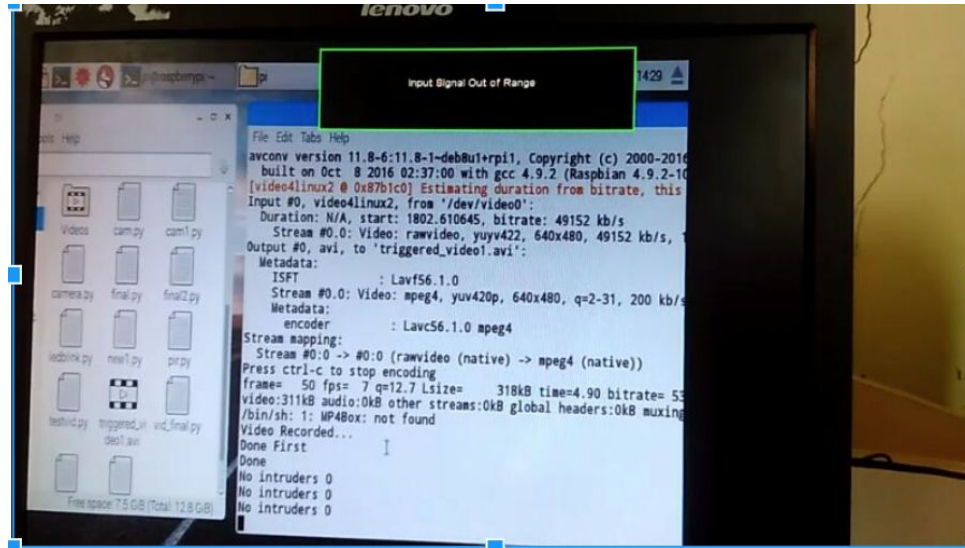


CONNECTING WIRE	PIN NO.
PIR Sensor GND	20
PIR Sensor VCC	2
PIR Sensor OUT	11
Resistor	14
LED	13

## Working Of Circuit

The raspberry pi executes a python program that starts when the raspberry pi is booted and waits for the motion to be detected by the PIR Sensor. As soon as motion is sensed by the PIR sensor, the LED lights up showing us that motion has been detected and the python code for recording videos is executed. The pictures and videos are stored in the home directory of the pi with the file names "" and "triggered\_video1.avi", respectively. As the program is in an infinite loop, every time a picture or video is saved the count in the filename is incremented by one. The images have a .jpg extension whereas the video has a .avi extension and can be viewed using the built in avplay.





## **List Of Components Used For The Circuit**

1. Raspberry pi 3
2. Webcam
3. PIR Sensor
4. LED
5. Bread Board
6. Resistor(1k)
7. Connecting wires

## **Brief Description Of The Components Used**

### **1. Raspberry pi 3**



A Raspberry pi is a credit-card sized computer that can be used to function as a proper desktop computer or can be used to build smart devices. We can expand the Raspberry pi computer with modules like adding a camera module or a touch screen module to increase the scope of the device. The naming systems of the Pi are Pi-1 ,Pi-2 and Pi-3 which indicate the generation of the model. Models A, A+, B and B+ indicate the power and features.

## **2. Webcam**



A webcam is a video camera that feeds or streams its image in real time to or through a computer to a computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and emailed as an attachment. a webcam is generally connected by a USB cable

## **3.PIR Sensor**





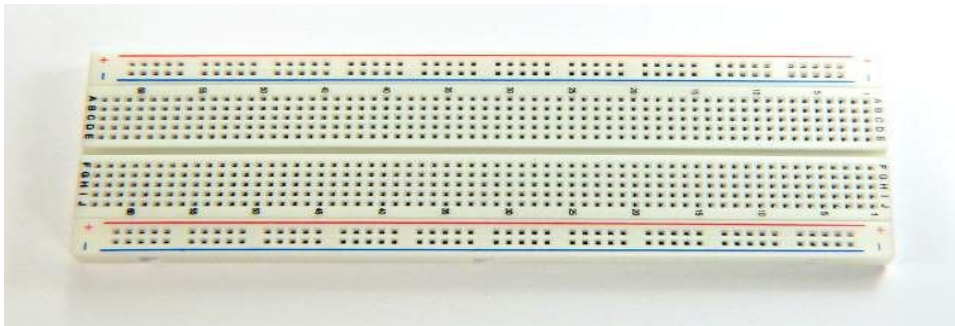
A passive infrared sensor is an electronic sensor that measures infrared(IR) light radiating from objects in its field of view.

#### **4. LED**



A Light Emitting diode(LED) is a semiconductor device that emits visible light when an electric current passes through it. The light is not particularly bright but in most LEDs it is monochromatic ,occurring at a single wavelength.

#### **5. BreadBoard**



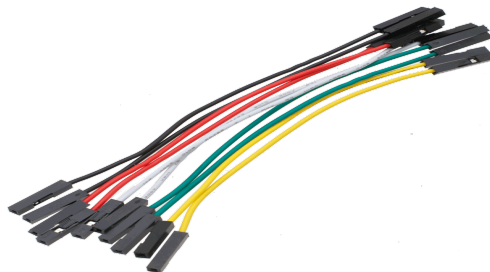
A breadboard is used to build and test circuits quickly before finalizing any circuit design. The breadboard has many holes into which circuit components like ICs and resistors can be inserted. The breadboard has strips of metal which run underneath the board and connect the holes on top of the board.

## **6. Resistor**



A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements and terminate transmission lines among other uses.

## **7. Connecting Wires**



Connecting wires are used to connect the different components of a circuit.

## **Determining The Output Of The Project**

We ran our project on the terminal and simulated a scenario it might encounter when kept in the wild. We used our fingers and toy animals as our test subjects, whose motion was to be detected and captured by the project. Initially there was no change in the grid of the PIR sensor. On moving our subject, the sensor detected its motion and the code for capturing the images/video began to run. It was stored in the home directory. On detecting motion again, the same process began again and new image/video was saved. This continued till the program was manually forced to shut down by pressing the CTRL+C. On viewing the video in the avplay and images, we found footage of the test subject. Hence, our test outcome was positive with our goal of capturing pics and videos of wildlife being achieved.

## **Manual On How To Operate The Project**

The stepwise procedure for the smooth operation of the project is as follows:

1. Connect the PIR sensor and USB webcam to the pi as per the circuit diagram. Ensure that the camera is positioned in such a way as to capture the footage of the cause behind the motion detected.
2. Also connect the power source and then boot the raspberry pi.
3. Open the terminal and type in the following command, "*sudo python vid\_final.py*". The project would start implementing.
4. Whenever the PIR sensor detects motion it would take a pic or start taking a video recording depending on which code we run.
5. The program can be terminated by pressing CTRL+C.
6. The pictures and videos are stored in the pi home directory.
7. To view the videos, click on them. A popup window would appear. Type *"/usr/bin/avplay"* in the text box provided and press OK. The recorded video will be played.
8. The images and videos would have a suffix in its filename that gets incremented with the count of how many times motion has been sensed.

## **Applications Of The Circuit**

1. Images are captured only when motion is detected instead of recording whole day, which enables less power and memory usage.
2. Rather than hiding behind bushes and risking our lives to take a picture of animals we can choose a suitable spot to place the camera thereby decreasing the risk factor of lives.
3. Use of Ultrasonic sensor or IR sensor can detect the presence of burglar or intruder .
4. Project can be improved to make a visitor monitoring system.

## **Limitations Of The Components Used In The Circuit**

1. Limited range of the PIR Sensor
2. Low quality image resolution

## **Further Improvements To The Circuit**

1. Using suitable components like sensors which can detect the presence of light the circuit can also be used to sense whether it is day or night. Infrared sensors can be included in the circuit for night time image capturing.
2. The whole circuit can be placed in a waterproof container to prevent the adverse effects of weather changes to hamper with the circuits operations.
3. The images and videos saved in the pi can be mailed to a predefined email ID.
4. Pi camera could be used instead of the webcam as it has better resolution and framerate.
5. The device can be made more portable by including a power source and wifi dongle compatible with the pi.
6. Use of more sensitive and higher range sensors.

## **Obstacles we faced**

Our project was mostly code based and we had to face a few obstacles in installing and upgrading the packages. Initially even though our Raspberry pi was working fine we faced a few difficulties with our Pi-camera module as it was not working properly, hence we had to replace our pi camera with webcam due to budget constraints. The next major problem we faced was with the PIR sensor which was unable to detect motion, initially for a while we thought that the fault was with PIR

sensor ,but later we checked whether it was working on other's circuit and it seemed to work fine. We couldn't properly understand the problem with the PIR sensor , but we were determined to make the project and thought of all possibilities like adjusting the sensitivity to make the circuit work properly.We decided to insert the PIR sensor in a different pin on the Raspberry pi and were elated to know that it worked indeed. We also mentioned about mailing the video to a predefined mail address in our proposal initially but due to time constraints and the last minute problems that arose in the circuit we failed to do so. However, the entire journey of forming a group, dividing work, replacing components, solving issues was worth it as we learnt a lot from it.

## **Conclusion**

Using components like Raspberry pi,Webcam,PIR sensor and a few other basic components we could successfully build a user-friendly system that is completely automatic,could be armed and disarmed on its own whenever motion was detected without user's interference.