

# Home & Enterprise Security Solutions Using Vision Intelligence

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**Abstract**— Security is something that is essential for us in today's world where crime rate is very high. The purpose of this paper is to provide a reliable, secure and low cost security system for middle class people. Idea of the proposed system is to use vision intelligence using Artificial Intelligence (AI) and Machine Learning (ML) to detect any kind of criminal activity. The proposed system will prevent it with fog canons that are used to make the visibility zero in few seconds and it also do IVR calls to nearest police station which will ultimately make conditions worse for intruder victim in that situation. So it is expected that the intruder will leave the situation/place immediately.

**Keywords**— Fog Canons, Alarm, Zero Visibility, IVR Calls, AI, Vision Intelligence and Security.

## I. INTRODUCTION

As due to excessively high crime rate we are proposing this security system which provides an advanced security system which uses AI, ML & Fog Canons. It is mainly focused on the middle class people who can't afford expensive security systems. This is only a proposed model about this security system.

**Vision: - “If we can make intruders blind they can't do anything”.**

This Security system creates dense harmless fog, which makes zero visibility, fires alarm and also do IVR calls to the nearest police station in an emergency condition.

## II. LIMITATIONS OF STUDY

It is not yet tested in practical environments but our system once completed, it's accuracy will be

good enough to handle those and it will be keep increasing as it always be learning from the massive amount of data incoming through all node camera's in the network.

## III. METHODOLOGY

1. This Security System is using camera's enabled with live machine learning algorithms and artificial intelligence (Vision Intelligence) to recognize if there is any kind of breakout or crime happening at the moment in home, shops and other places.
2. The fog canons to fire up whenever there is a breakout, it usually takes 1 or 2 seconds to make zero visibility in a 40 sq. ft. room.
3. It uses Arduino to fire up the alarm, it might change because of the reliability & security purpose. Only for the demo it is using an Arduino Uno board but in practical implementation with implemented vision intelligence it will use a raspberry pi device.
4. System will do an automated detailed emergency IVR calls to nearest police station once completed.

## IV. NEED OF A BETTER SECURITY SYSTEM

As there are too many camera's generating huge amount of data, further monitoring of all those

systems is very tough manually, that's why there is a requirement to have an intelligent surveillance system to replace the older ineffective systems [4].

According to NCRB (National Crime Records Bureau), the people of India are facing too many crimes like theft, housebreak, robbery and burglary. According to same report, it was proven that in 2017, there was 1 case every 3 minute of robbery, theft, burglary and banditry.

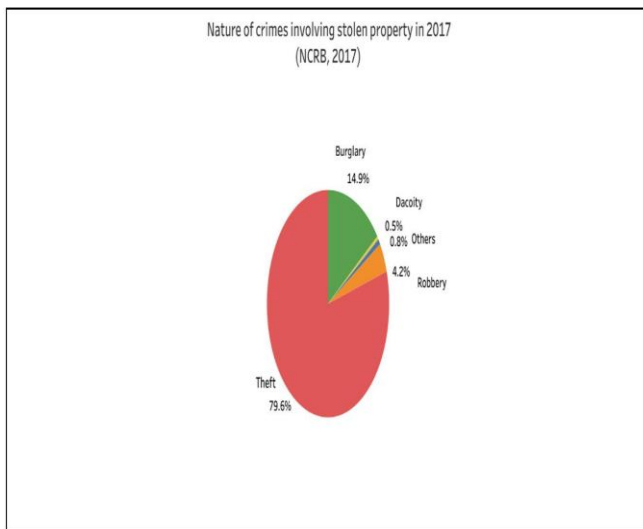


Fig 1: Latest Crime Report by NCRB [1].

In Figure 1, the snapshot of a report shows that most of the crimes were cases of theft (the red area) of which many were attempted in house, shops and other residential and working places. Our product is the best tool for such condition. It will help to move from passive surveillance to active defence from these intruders.

Security of a security system is also very necessary especially when some advanced technologies like AI & ML are involved because once completed it will work itself no one will be monitoring it manually [5].

Once completed this will be able to detect:-

1. Intruder Detection.
2. Threatening Detection.

3. Weapon Threatening Detection.
4. Glass Break Detection.
5. Gas leakage detection.
6. Due to compatibility with all security systems our system is very versatile.

## V. WORKING PRINCIPLE

This security system is equipped with a motion detector, fog machine, Alarm, night vision camera, gas detector, fire detector and raspberry pi. So, the vision system will keep searching for the any suspicious activity and the motion detector can be activated when there is no one at home or it can be used as a boundary for a restricted area.

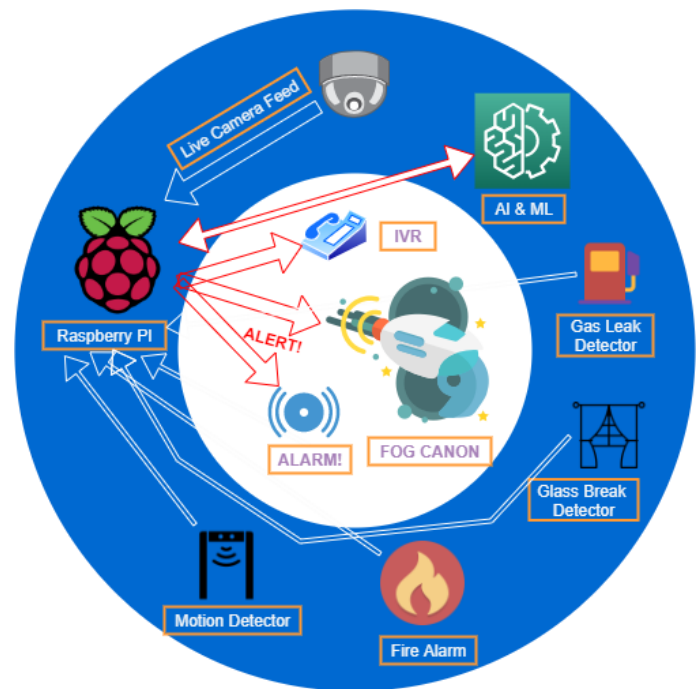


Fig 2: Our Security System Model

In the above it is shown that every device will be connected to the Raspberry Pi or Jetson Nano device to control them, as soon as the system will detect any kind of breakout it will first hit the raspberry pi and it will verify with vision intelligence before firing alarm and in any case if vision intelligence found to be not working in that case it will just fire the alarm.

It has been seen that using web technologies portability of surveillance can also be provided as some other systems has already did [10].

#### VI. COMPONENTS OF SYSTEM

These are all components which are used to make a demo of this security system while implementing in practical conditions some of them might change but the working will be exactly same.

Using IOT components in a security system also creates a concern for user privacy and attacks such as spoofing, denial of service, jamming, and eavesdropping [7].

Many security challenges and vulnerabilities to IOT in security systems were understood like physical attacks, link layer security issues, network layer attacks and many more [6][9]. As it is just a demo so it's not a problem for now.

Some other security techniques with proven results were also studied for making the best approach to make a reliable security system one of the techniques was pre-alarm system based on real-time monitoring [8].

##### I. ARDUINO UNO NANO BOARD:-

It is used for receiving signals from the sensors, as it will receive any signal it will fire the alarm.

##### II. ULTRASONIC SENSOR:-

It is used as a motion detector.

##### III. GAS LEAK SENSOR:-

It is used for detecting any gas leakage.

##### IV. CAMERA:-

It is very crucial element for this system. In the demo implementation mobile camera is used but in real implementation something more reliable will be used.

##### V. FIRE SENSOR:-

It is used for detecting fire.

##### VI. ALARM WITH LED:-

As Arduino will fire up a signal the alarm and the led will be on, it can be switched off manually in case of a false alarm.

##### VII. FOG CANON:-

It's the main component of our system it fires fog whenever any threat is detected.

##### VIII. GLASS BREAK DETECTOR:-

It is used whenever someone breaks the window glass, so it will alert the system.



Fig 3: Fog Canon with Glycerol Solution

In the above image fog canon & glycerol solution is shown. Glycerol solution is used to make the fog, when glycerol is heated up to a temperature of more than 170° degree Celsius it creates heavy white fog which stay there for at least 15 minutes making the visibility zero.

#### VII. IMPLEMENTATION

A demo module is created to show the actual process that will happen during the real implementation of our system, the intruder detection system is under process due to too much work on accuracy but for now it has used unknown face detection for some time. Some techniques has

been understood and analysed for a better approach [2].

Every sensor is connected with the Arduino Uno board and python library (serial) is used to control Arduino for the vision intelligence system. As any detection will happened from vision intelligence it will send the alarm signal to the Arduino and it will fire up all the alarms

IVR call system is not yet implemented in the demo but it will be implemented it in real system. . From previous related research it was understood that it will cost higher to make a well communicating & reliable security system that's why the real implementation is in still work [3].

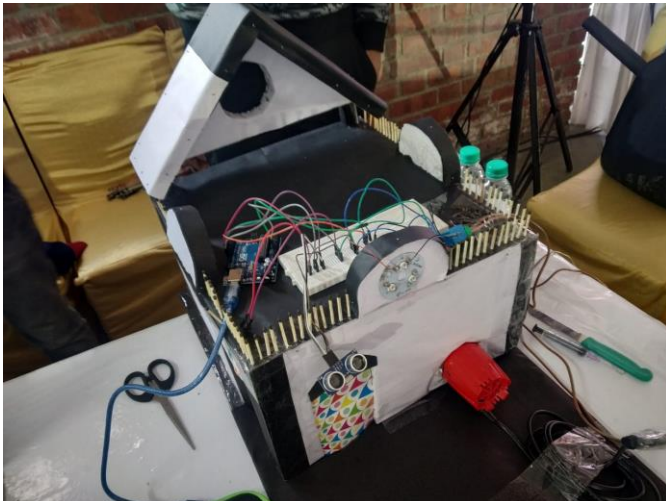


Fig 4: Demo Module Image



Fig 5: Gun detection in video using Python OpenCV



Fig 5: Unknown face detection using Python OpenCV

## VII. CONCLUSION AND FUTURE SCOPE

This security system model is designed to face the Indian criminal situations. It has been analysed that the proposed system may work very well specially with the concern of a costing model. Though the model has been analysed further the implementations is to be considered as a future scope which can be published further.

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