AI Based Intrusion Detection System using Multi Sensors

R Karthikeyan*, L K Hema, S Vineet, P Vivek Prajapati, and Paul Reginald
Department of Electronics and Communication Engineering, Aarupadai Veedu
Institute of Technology, Vinayaka Missions Research Foundation, Paiyanoor, Tamil Nadu, India
Email: *rrmdkarthikeyan@gmail.com

Abstract. In an intrusion detection system, the existing system uses single sensor that causes false alarms due to lack of accuracy and also leads to misuse of fuels that are stored in nuclear power plants/ reactors. The fuels that are used in the reactors are too expensive and high in price. The fuels use in nuclear power plants/ reactors must be protected under such circumstances that may reduce the detection and inactive secure system of false alarms under given area. In this paper multiple sensors are used to interface with Arduino to overcome false detection using KNN algorithm for the classification of nearest neighboring values that compares with the predefined and predicted values in the given database. Hence the KNN uses to forecast a new point in sample classification, a database where the data points are divided into many groups. This is the point where KNN is located in the Scikit-learning algorithm list. Therefore, the K Nearest Neighbors method stores all available cases and starting lineup cases on the basis of mutual information.

Keywords: AI, Arduino, Safety, KNN, Scikit-learn, secure system, sensors.

1. Introduction

1.1. Device For Intrusion Detection

An IDS is an intruder sensing device, computer that detects unauthorised behaviour or policy breaches of a network or processes [1]. The primary purpose of IDS is to reduce the reoccurrence of false alarm prompt because the existing system uses single sensors to detect obstacles which may cause failure of security networks if there are any technical errors in the given module / sensor that conclude that there is a lack of accuracy [2]. Modern IDS allows the multiple sensors to interface with Arduino and uses KNN algorithm to classify. In order to predict the classification of a new sampling point, a database in which the data points are divided into many groups. The use of multiple sensors is also more useful in improving the accuracy and reliability of the system. [3].

1.2. Artificial Intelligence

Artificial Intelligence (AI) is a branch of software engineering that focuses on the development of intelligence machines, thinkers and people-like systems [4]. Understanding voice, addressing challenges, teaching and planning, definitely. An AI uses machine learning language for problem solving. For learning machine level language AI uses KNN algorithm based classifier [5]. The AI tools that are used in the development this system Scikit-learn [6].

1.3. Scikit-Learn

Scikit-learn are an open-source framework for Python machine learning that is helpful for data processing, data processing and visualization of data. To name a few, it is useful for grouping, regression, clustering, reducing dimensionality, model collection, and pre-processing [7]. NumPy,
SciPy, and matplotlib are based on it. It runs faster than R using Python and has better results. No decentralized version will be available, though, and it is not suitable for larger datasets [8].

1.4. Physical Protection System
During this analysis, the IDS are focused on the physical security system. A network components compilation, which is related to protection by an entity, is a physical protection scheme (PPS) [9]. Due to the differences in facilities, targets and dangers, physical protective devices at various sites are rarely identical [10].

2. Project Description
The aim of this paper is to build AI based intrusion detection system using multiple sensors interfacing an Arduino AT mega 328P and AI technology with the help of KNN [11] machine learning algorithm to avoid False Alarms and making the system more reliable. The block diagram of the system is shown in Figure 1.

![Figure 1: Intrusion System](image)

2.1. Arduino Uno
The Arduino Uno is the 8-bit microcontroller board ATmega328P. The microcontroller supports other components besides the ATmega328P, such as the crystal oscillator, serial connection, voltage controller etc [12].

2.2. IR (Infra-Red Sensor)
A general-purpose proximity sensor is the IR Sensor-Single. We use it here for detecting collisions. The module is composed of a pair of IR emitters and IR receivers. An IR signal is often sensed by a high precision IR receiver. The module is composed of an IC comparator 358 [13].

2.3. Ultrasonic Sensor
When 40000 Hz, it produces an ultrasound that travels through the air and rebounds back to the module regardless of whether the object is present or blocked [14]. The distance can be determined by the journey time and the sound speed. For the HC-SR04 Ultrasonic Module four sticks, Ground, VCC, Trig and Echo are available. We must set the trig to an elevated stage of 10 μs to build an ultrasound. This sends out an 8-cycle harmonic explosion which travels and receives this at speed noise in the echo pin [15].

2.4. Accelerometer (MPU6050)
The MPU-6050 is an IMU sensor featuring an accelerometer MEMS (Micro Electromechanical System) and a single chip MEMS Gyroscope. IMU Sensor, where IMU stands for Inertial Measurement Unit, is a system that uses accelerometers to calculate the real power, gyroscope angular rate and gravitational pull using multiple sensors [16].
3. Project Implementation
This workflow of the intrusion detection system is shown in Figure 2. It describes the instruction and workflow of the idea.

![Flow diagram of the intrusion system](image)

**Figure 2:** Flow diagram of the intrusion system

The circuit implementation of the intrusion detection system is shown in Figure 3. Modules like IR sensor, ultrasonic sensor and accelerometer can be viewed to the PC. It describes intrusion detection to the system. The system can be readily monitored to the system.

![Circuit diagram of intrusion system](image)

**Figure 3:** Circuit diagram of intrusion system

4. Results and Discussion

![Output of Normal Condition](image)

**Figure 4:** Output of Normal Condition
On execution of the above code the Arduino fetch the data with predicted values. Hence the given condition will automatically display on screen.

The Figure 4 shows the information about the intrusion system works normal. The normal system is the data sent to PC. The below Figure 5 represents the alarm, and the raw value can be viewed in the com port of the PC. Data like IR data, ultrasonic data, and accelerometer can be viewed through this and the status can be alarmed to the external users or the persons.

From Figure 6 live graph report can be projected like IR data, ultrasonic data and accelerometer. The graph is used for the prediction of future circumstances in the field.

The accelerometer and IR data can be viewed and can be predicted. For example, the vibration with high level of pitch can be easily detected and if any cases accidental touches will able neglect the alarming circumstances. The graphical reports are shown in Figure 7.
5. Conclusion
This paper aims to provide users with the intrusion protection approach and to provide a detailed understanding of certain specialized strategies for intrusion detection. The key benefit is that several synchronizations of sensors is rendered so that there is little to think about false alarm if any of the detectors fails to respond. Thus, to achieve its usefulness, the false warning prompt is decreased.

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