Concealed Weapon Detection (CWD) System Development

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1 Introduction

This research aims to design and develop a Concealed Weapon Detection (CWD) system which will be able to accurately distinguish between lethal and non lethal metallic objects. This system can be deployed in large areas where preliminary search is required, i.e schools, airports, corridors, entrance to apartments, stadiums, outdoor events etc.

2 Why this system?

- Threat is determined & tracked in real time
- No invasion of privacy unlike other weapon detection system
- Unlike imaging based detection, no human interpretation of threat is necessary
- As list of threat objects grows ever longer so also the increased risk of error & inconsistency in judgment for operator
- Low false alarm rate as compared to other weapon detectors
- Array architecture and multiple transmitter & receiver gives no dead zone in the system

3 System Operation

- All metallic objects in a time varying magnetic field produce eddy currents which decays with time (known as time constant).
- This unique property of metal is dependent on size, shape & physical composition of metal. Hence a weapon database could be created using time constant as object signature. Details of object signature of a gun is shown in Fig 1

Metallic object detection and classification

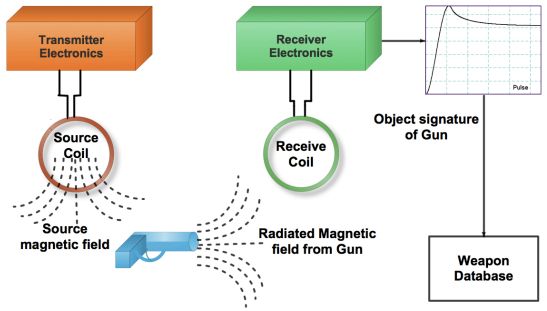

Fig 1: Object Signature Analysis

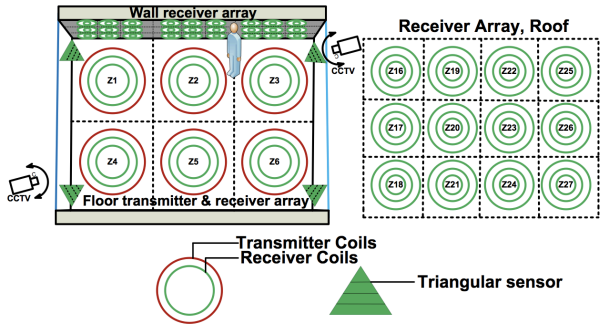

Fig 2: Multi Zonal Array Architecture

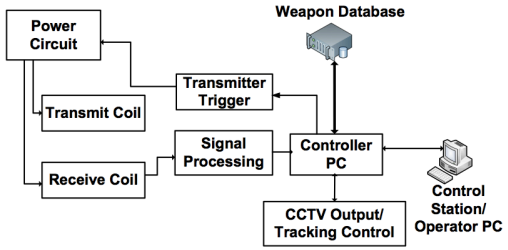

Fig 3: CWD Signal Block Diagram

4 Multi Zonal Array Architecture

- Arrangement of coils in multiple zones in an array improves the weapon detection & threat is monitored in real time
- Object signature of metallic object is analysed and compared with weapon database. This reduces false alarms created by commonly used non lethal objects such as key rings, watch, belt buckle, coins etc.
- Fig 2 shows multi zonal array architecture of CWD system.

5 Signal Block Diagram

- Trigger circuit is used to control the pulse frequency of the transmitter
- Induced eddy current decay time is measured from receiver coils. It is then processed & compared with weapon database to create an alarm if object signature is matched with signature in the weapon database. A CCTV tracking system is activated to monitor any individual carrying a suspicious object in real time
- Fig 3 shows the signal block diagram of CWD system

6 Research Tasks

- Signature database for threats
- Fast coils for better performance
- High speed signal processing for faster detection
- Integration with neural analyzer for better threat classification