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An Interactive Robust Artificial Intelligence-based Defense Electro Robot (RAIDER) using a Pan-Tilt-Zoom Camera

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The Robust Artificial Intelligence-based Defense Electro Robot (RAIDER)

What is the RAIDER?
The Robust Artificial Intelligence-based Defense Electro Robot is an autonomous Unmanned Ground Vehicle (UGV).

Robotic Base: The Husky A200 from Clearpath Robotics

- Base Equipment:
  - Network Router
  - 2 Arecont IP Cameras
  - 2 Axis PTZ Base Cameras
  - Microsoft Kinect
  - Onboard Processor
  - Vocalization Speakers

System Hardware Design

- Control Processing
  - Automatic Detection, Recognition and Tracking image processing algorithms determine the direction and speed of the Robot

- Robot Onboard Processing
  - Network Trafficking and Communication among all IP cameras
  - Robot Operating System
  - Ethernet – RS232 Convertor of Robot Control Signals

Modalities of Surveillance

- Flag a Person of Interest
- Body Detection/Recognition
  - Flag Suspicious Human Activity
- Pose Invariant Face Detection/Recognition
- Iris Recognition

What Can It Do?

Multiple Modalities of Surveillance

- Face Detection and Recognition
- Human Body Detection and Recognition
- Iris Identification of Individuals
- Detection of Changes to the Scene
- Human Activity and Action Recognition

Autonomous Navigation

- Following a Person of Interest
- Avoidance of Obstacles
- Reaction to Changes in the Scene

Scene Visibility and Understanding

- 3D Scene Reconstruction
- Ability to perform in multiple variations of weather, lighting and terrains

Autonomous Navigation

- Autonomous control signals from computer vision algorithms
- Challenges:
  - Vision-based Depth estimations
  - “Remembering” scene
  - Obstacle avoidance
    - Stationary
    - Moving
  - Optimal Path Selection

3D Scene Reconstruction

- In order to be able to navigate itself, the RAIDER relies on accurate 3D reconstruction to understand the depths and remember the surrounding environment.