AARM Flyer

07 March 2018

Overview

AARM combines AI & Robotics. AARM will develop a reconfigurable sensor drone module for analysis of buildings, infrastructure and environments, and search and rescue. It will detect anomalies leading to improved safety and cost savings. Our simple, flexible system can operate in multiple domains and preclude the need to buy separate task-specific systems.

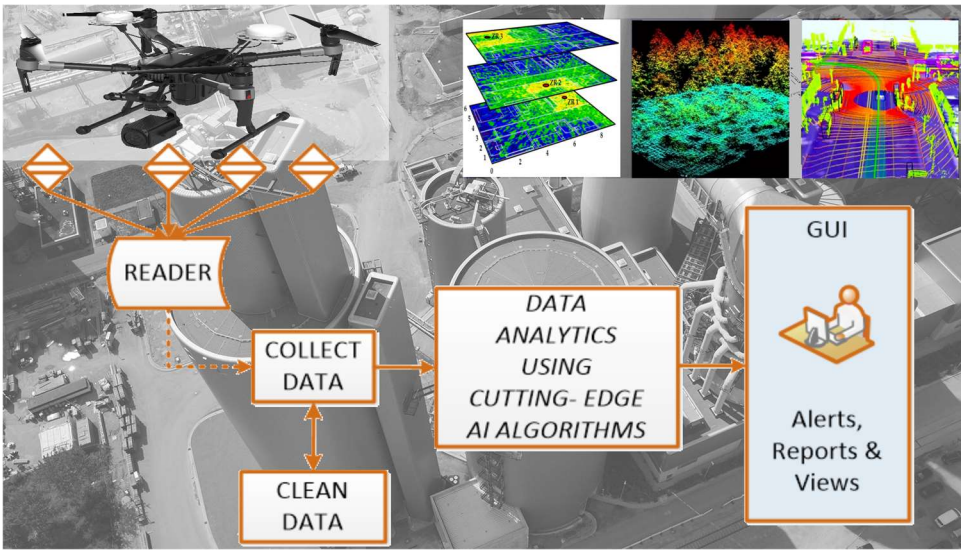
AARM is a module of hot-swappable sensor and processing plates that clip together, attach to the drone, communicate with each other and transmit their data for on-site analysis.

Our cutting edge AI software analyses these data on-site to guide the drone and to detect anomalies.

An Adaptive and Autonomous Robotics Module (AARM)

Introduction

Mobile robots such as UGVS and UAVs (drones) can be used for surveillance, monitoring, and emergency response - on infrastructure and environments. The importance of accurate and multi-faceted analyses is well known. This motivates the need for flexible, autonomous and powerful decision making mobile robots that can be highly customised for diverse application domains to reduce overall costs. These systems need to be able to learn through fusing data from multiple sources. Until very recently, such surveillance and monitoring robots have been task-specific.



Survey, collect data, analyze data, identify anomalies and produce alerts.

Examine and analyze buildings, infrastructure and environments.

Solution

We are developing a mobile robotics module, comprising a set of plug and play plates that can be configured into the module either by a user or by a robotic arm. Each module contains a combination of powerful processing plates, sensors plates and technology plates. Each module can be mounted on a UGV or UAV and used to analyze infrastructure and environments or for search and rescue missions. The module can be reconfigured with new sensors when necessary or faulty plates replaced using a robot arm or by a human operator.

Contact Us

Dr Victoria Hodge

Digital Creativity Labs
Ron Cooke Hub
University of York
Heslington
York, YO10 5GE

Phone
+44 1904 325637

Email
vicky@digitalcreativity.ac.uk

Website
www-users.cs.york.ac.uk/vicky

Twitter
@vjhodge

Anomaly Detection

The AARM plates stream their data to anomaly detection software, either contained in the processing plates or on site, for example using a laptop or tablet. We aim to process on site for fastest response and to minimise communication overheads. Our software uses the latest artificial intelligence (AI) technologies to analyse the streamed data and to detect anomalies. We use a range of techniques to enable accurate and holistic analyses. These analyses can detect problems rapidly and help to prevent failures which leads to improved safety and cost savings.

Drone & Detection Simulation

We are developing a framework in Unity 3-D (*https://unity3d.com/*) to produce a drone simulation environment for anomaly detection, location and monitoring. We will generate 3-D simulations of buildings, infrastructure and environments: for example, **a chemical leak in a factory, a collapsed building or a search and rescue mission**. We can then use the simulations to train UAVs to detect and locate anomalies: **detecting noxious gases and finding the source, detecting human body heat and geotagging the location or detecting emergency beacon signals and geotagging**. We will use deep learning AI as our decision support tool for anomaly detection and location. This deep learning network (DN) uses data from the UAV's on-board sensors to provide a sensor reading. It can then use this reading to detect anomalies, calculate the location of the anomaly and to guide the drone. The deep network forms a recommender system to recommend the direction of travel of the drone to hone in on the anomaly site. The actual drone navigation will still be under human guidance or using autonomous drones. For safety, the drone's navigation mechanism is separate from our anomaly detector/ recommender network. The recommender will never override the drone navigation; it is purely recommendation.

The drone will ultimately be used to generate real-time augmented reality (AR) displays of buildings, infrastructure and environments for human operators. Overlaying sensor analyses, heatmaps and alerts onto video images from the drone in real-time.