UAV R&D Directions (DLSU)

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Outline of Presentation

- Introduction
- UAV Initiatives of DLSU
- UAV R&D Gaps
- UAV S&T Activities

Introduction

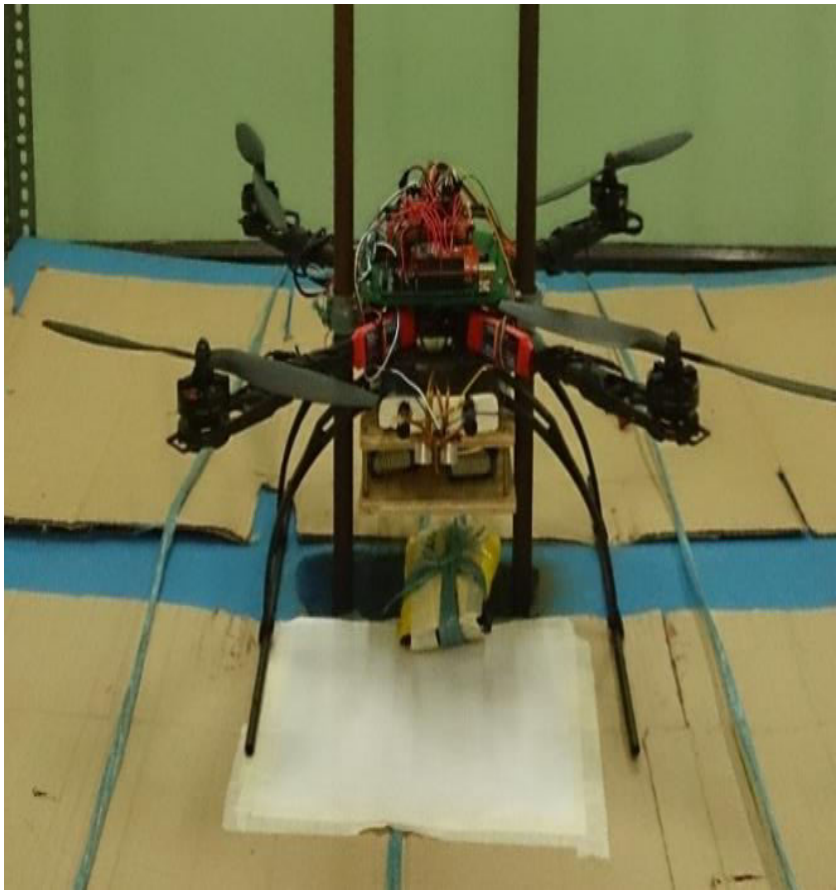
- DLSU started UAV research around five years ago
- Departments doing UAV research:
  - Mechanical Engineering
  - Electronics and Communications Engineering Department
  - Computer Technology

UAV Initiatives of DLSU

Development of a Quadrotor Control System with Obstacle Detection System

1. DJI 450 frame
2. Crius Flight Controller
3. Arduino Controller
4. Kalman Filter implementation
5. Ultrasonic Sensors for obstacle detection system

UAV Initiatives of DLSU



Design of a Fuzzy GS-PID Controller for Payload Drops of Varying Mass for a Quadrotor

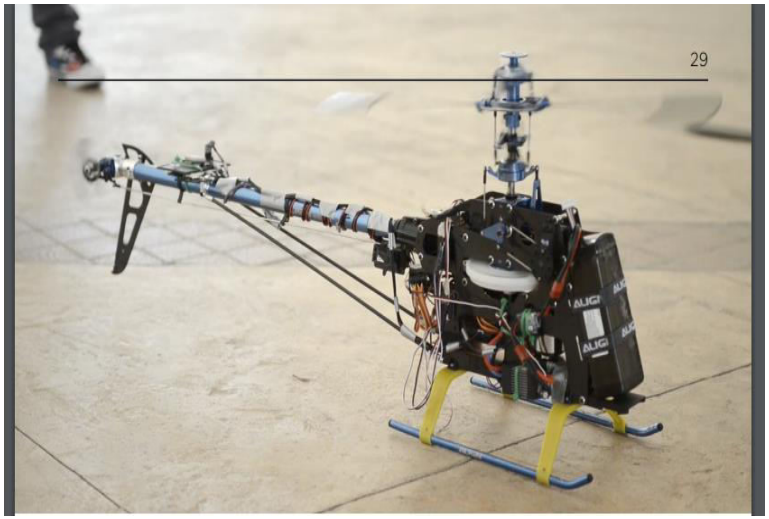
1. Tarot Iron Man 650 Frame
2. Arduino Controller
3. Fuzzy Logic
4. Payload Drop mechanism
5. Payload estimation algorithm

UAV Initiatives of DLSU

Implemetation of Two Quadrotors in an Octocopter Platform

1. Tarot IRON MAN T1000 Octo-Copter Carbon Fiber Frame
2. Fault Tolerant System
3. Fuzzy Logic and PID control
4. Autonomous and manual mode
5. Fabricated controller board

UAV Initiatives of DLSU



- Implementation of Speed and Torque Control on Quadrotor Altitude and Attitude Stability
- A System-based Rapid Screening Algorithm Using a Multirotor for Data Gathering
- Adarna project for Disaster Monitoring

UAV Initiatives of DLSU (on-going)

- Quadrotor with Autonomous Vertical Landing and Take-Off on a Terrestrial Teleoperated Mobile Robot
- Development of an Android App based Crop Dusting Hexacopter
- Computer-based Surveying System capable of Human Detection and Head Count with Picture and Location Streaming from Autonomous Quadrotor
- Vision system for River Basins Characterization
- Swarm Intelligence systems

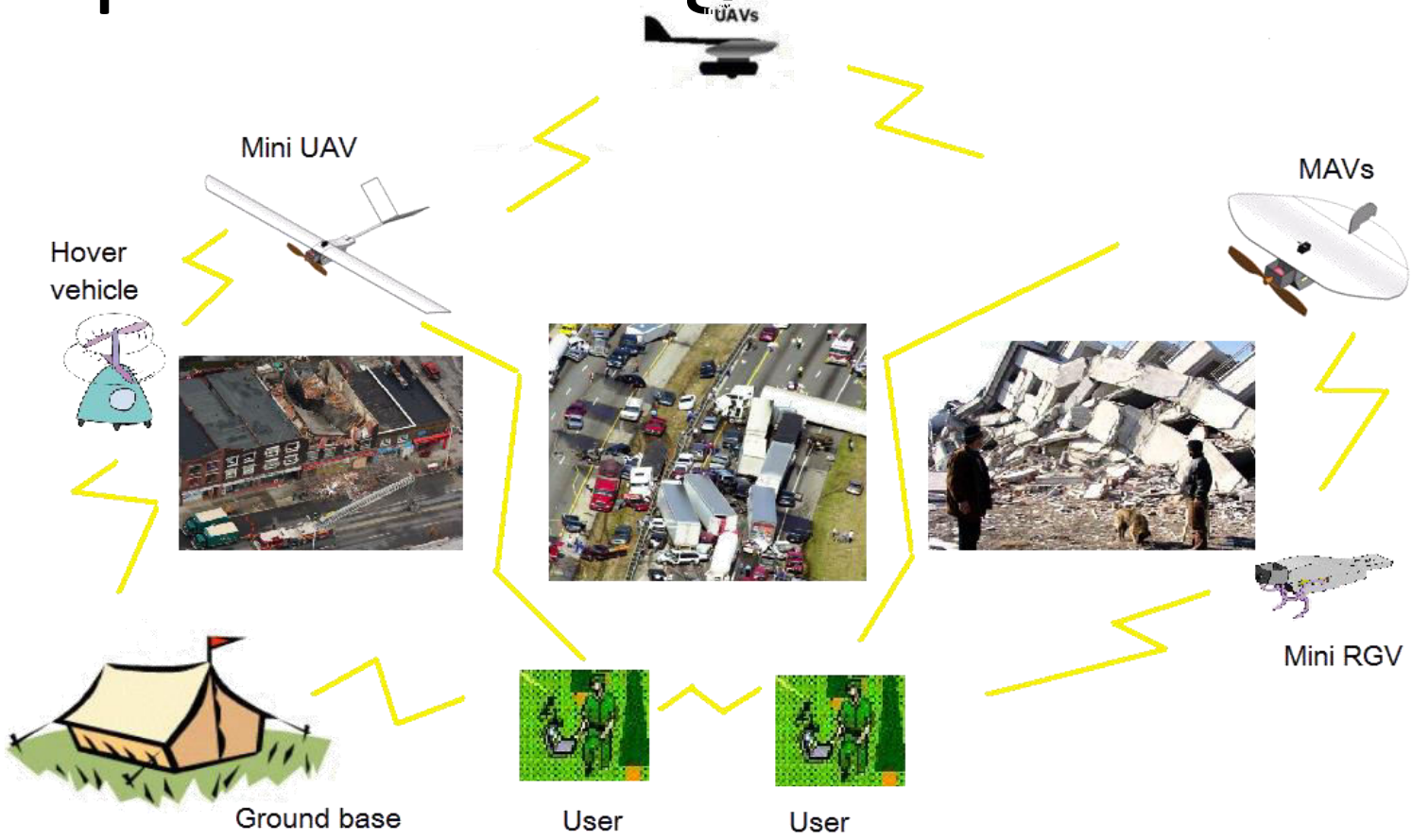
UAV R&D Gaps and S&T Activities

- Payload drop control technique
- Object detection based flight control
- Automated image stitching, quantify images and enhancements
- Vision based identification of People, Houses, Cars, Water, etc
- Swarm Intelligence for Search and Rescue Operations

UAV R&D Gaps and S&T Activities (Disaster Situation)

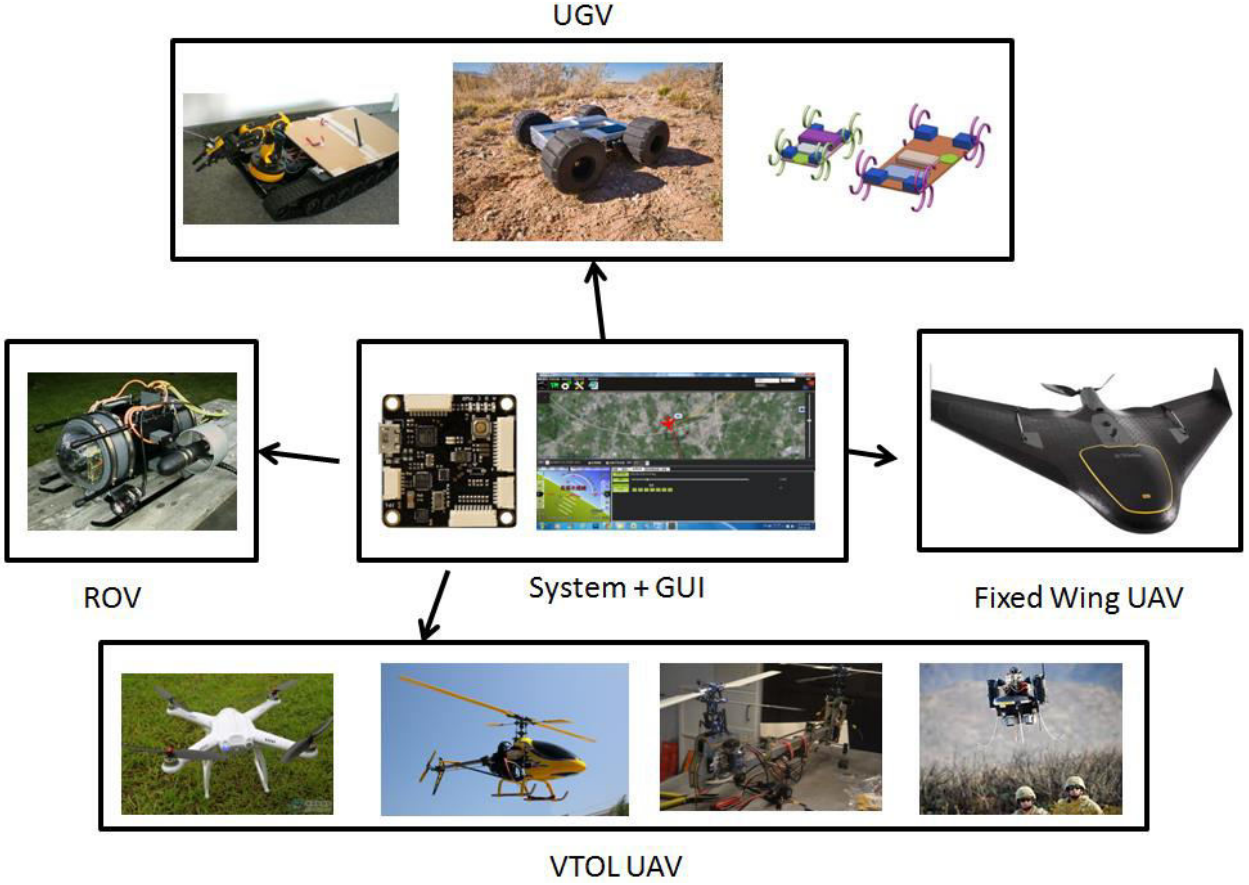
- Develop strategies for using heterogeneous vehicle for SAR and Disaster PMP missions

Operation using different vehicles



- **Fixed wing** UAV allows **large area scan & long endurance**
- **VTOL**/Hover vehicle allows **close range inspection**
- **Ground vehicle** – different **terrain** or **indoor operation**

Mission execution with unified control

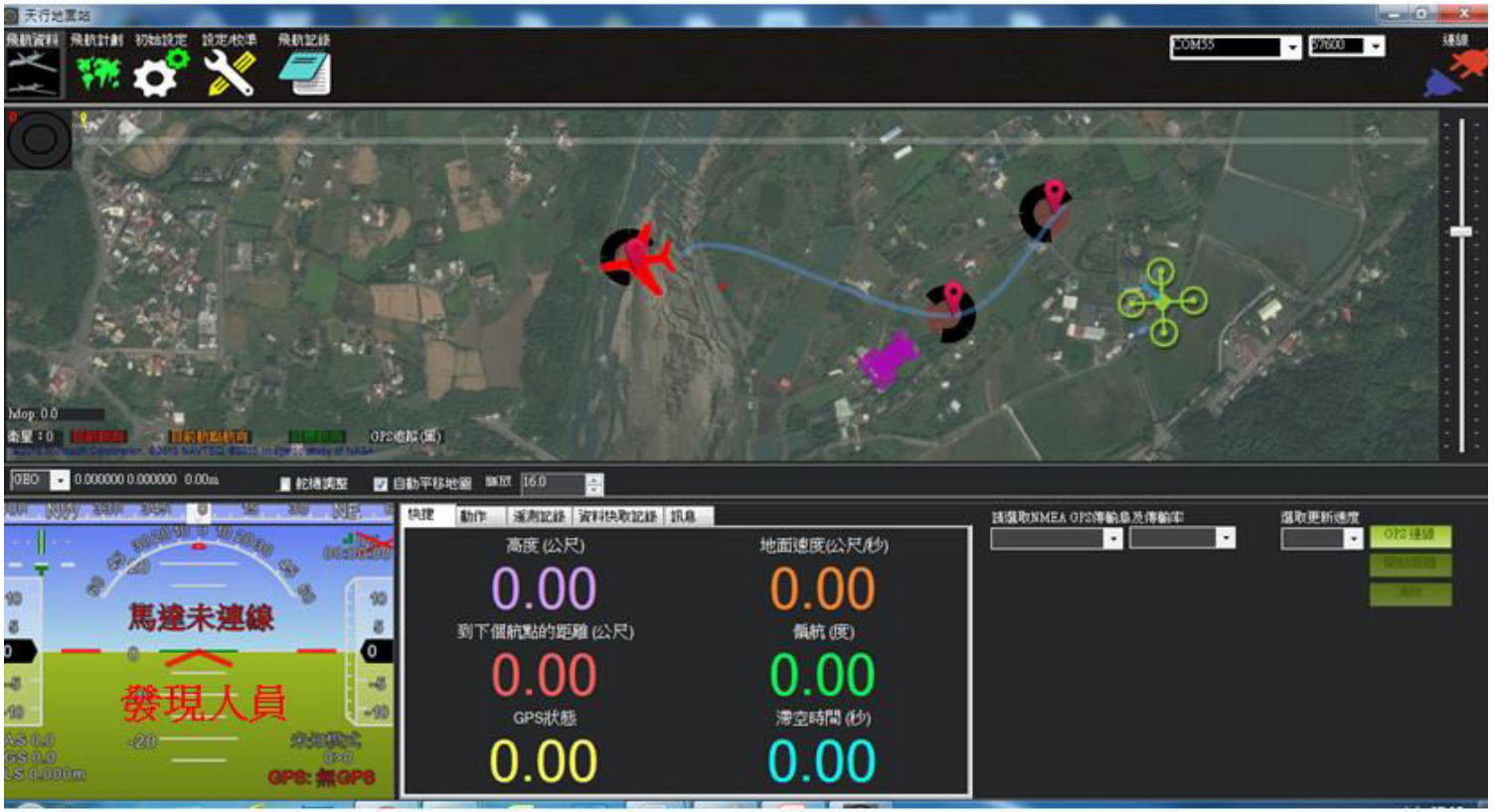


Integrate

\+ Different Sensors

- One control system for different type of vehicles
  - Fixed wing: large area search or aerial mapping
  - Vertical taking off and landing (VTOL): small area detail inspection

Operation – Ground Control Side



- Multiple vehicle – heterogeneous
- Using combination of image processing for automatic target identification
- Automatic search – lower down running cost

UAV R&D Gaps and S&T Activities (Disaster Situation)

- Develop UAV with image processing capabilities that will operate autonomously to perform SAR and Disaster PMP missions

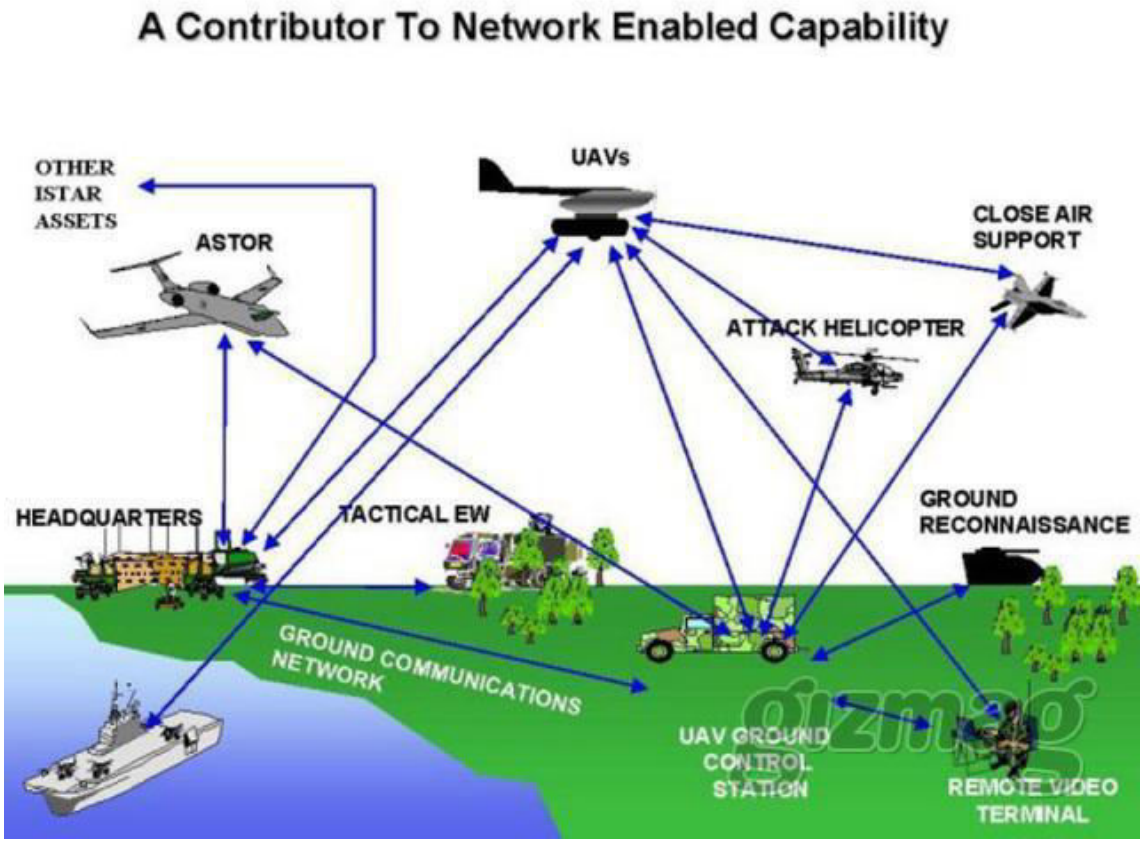
Real time view

- Display Thermal and RGB at same time
- Auto search for human
- RGB & Thermal can be added to on screen display (OSD)
- Operation at night is possible

UAV R&D Gaps and S&T Activities (Disaster Situation)

- Develop "Hybrid" mission vehicles with non-line-of-the-sight communication capabilities to boost the communication range significantly

Concept of network missions



- Common control system (or protocol)
- Data share allows fast reaction
- System of system approach

Applications

General autopilot system

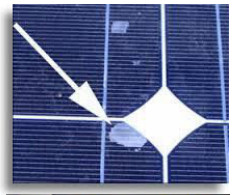
Portable ground control station

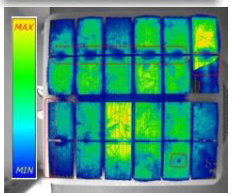
Main research area

Disaster search & rescue missions

Prototype robotic vehicles (air and land)

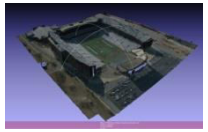
Other application





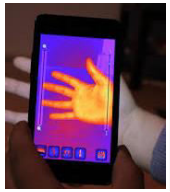
Solar panel (farm) inspection

Vision-based localization and mapping



System integration

NDT sensors



Other application

Power grid inspection

Other application

Offshore wind mill farm inspection

Enhance S&T Activities

- Collaboration with different local institution
  - Universities, government agencies, private sector
- Collaboration with other countries
  - Chung Yuan Christian University, Taiwan
  - Tokai University, Japan
  - University of New South Wales, Australia
  - Universiti Sains Malaysia, Malaysia
  - University of Gadjah Madah, Indonesia

Thank you