

Robotic Composite Photography

John Rogers

Department of Civil and Mechanical
Engineering, USMA

Unmanned Missions

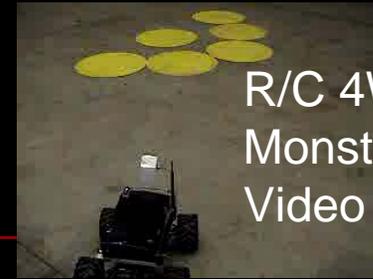
- Applications:
 - Indoor Reconnaissance—e.g. chemical spill
 - Under-Vehicle Inspection
 - Aerial Reconnaissance
- Localization required to accomplish mission
- Mapping is accomplished simultaneously

Mapping and Localization

- SLAM:
 - Simultaneous Localization and Mapping
- Ceiling view: MINERVA
 - <http://www.cs.cmu.edu/~minerva/>



Mapping the Ceiling

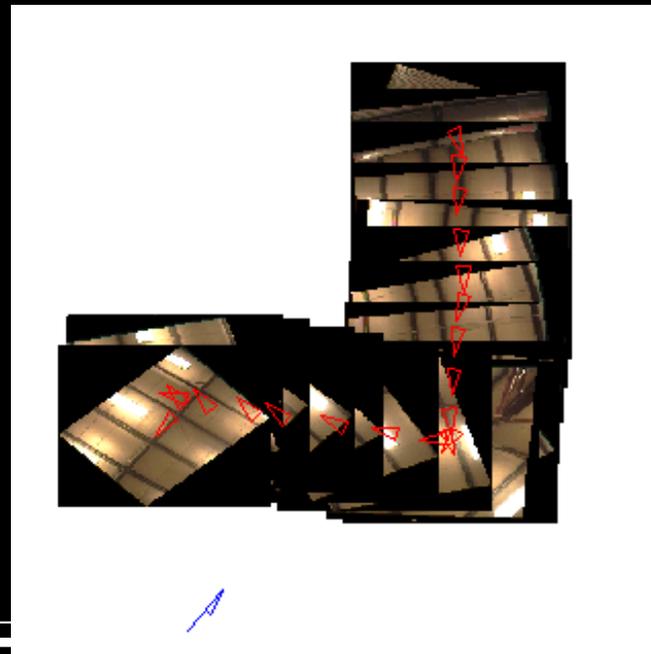


- Autonomous Chemical Sensing:
 - Needs Localization
 - Mapping spill would be useful
 - Mapping environment also useful
- Proposal: Map the Ceiling
 - Clear view—few obstacles
 - Greater distance to ceiling than floor
 - Field of view

Progress to Date



- Collected ceiling photos
- Automatically arranged photos
 - Odometry data
 - Heading data



Next Steps

- Image Registration
- Image Blending
- More Advanced Mapping:
 - Robot-to-base Communication
 - Multi-Unmanned Vehicle
 - UAV Implementation

Conclusion

- Successful first steps toward mapping and localization capability
- Next steps are laid out
- Great Project for USMA cadets