3D Mapping of Buildings from Stereo Images

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Background
3D surfaces in a scene can be constructed from sets of stereo images, acquired by two identical cameras located side-by-side or by one moving camera.

- Futaba 6EX 2.4GHz transmitter with R607FS receiver supports 6-channel remote control
- NDV -125 GPS uses NMEA-0183 Protocol and offers 5m CEP accuracy
- Bumblebee XB3 provides high resolution stereo vision 16 FPS via its 800Mb/s IEEE-1394b interface
- Parallax QuadRover provides a powerful and durable robotic base

Goals
- Set up a remote-controlled vehicle
- Design a stable platform to secure on-board devices and minimize vibration
- Install stereo camera to capture and rectify a series of side-by-side images of structures
- Develop an interface to communicate between GPS and the 3-D imaging program
- Run a series of trials and adjust parameters to produce an optimal 3-D model

Research Plan
- Simulate depth and feature from a series of stereo images captured to obtain 3-D Images (Simulations are developed by Qing-Xiong Yang)

Research Results
- Remote Control: 500ft range
- Satellite Data: Longitude, latitude, altitude, speed, satellites in view
- The camera captures 240x320 stereo images at 15fps
- Platform in progress and undergo tests to reduce vibration

Fundamental Questions/Challenges
- How parameters affect the image quality and what setup will produce the best result
- Communication between various devices
- Supply and allocate power for on-board devices
- Resolve image tearing and distortions due to device compatibility and vehicle vibration

Disparity
Feature Matching
Stereo Images
3-D Model
GPS GUI
GPS
- Obtain and interpret satellite data
Camera
- Stereo vision
PC/GPU
- Store stereo images
- Rectification
Rover
- Setup
- Bench test
Remote control
- Program and calibrate radio system

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