Collision Avoidance for Quadcopters

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Objective

The purpose of our project is to develop a system to be mounted on a quadcopter drone which can detect potential collisions with the outside environment and navigate the quadcopter to avoid such collisions.

Design

The microcontroller used is the Zybo Zynq-7000 System-on-a-Chip (SoC). The integrated hardware and software design approach of this board allows for easier interfacing between components, as bus interfaces can easily be added and configured in Vivado to connect our peripheral components to our board. This board also includes a NEON accelerator which allows for faster vectorized calculations.

Conclusions

- System capable of avoiding collisions when flying slowly forward
- Performance depends on environment, speed of drone

Disparity Map generated in MATLAB

Possible directions for performance improvement
- Configure system to automatically make use of cameras' full capabilities (white balance, exposure timing, etc.)
- Include GPU component on-board to improve speed of calculations
- VHDL model development for quicker pipeline

Possible areas for further research:
- Sensors to detect obstacles in every direction
- Compare different sensor arrays' performance
- Integrate with other systems for autonomous flight
- Best path navigation/navigation efficiency