

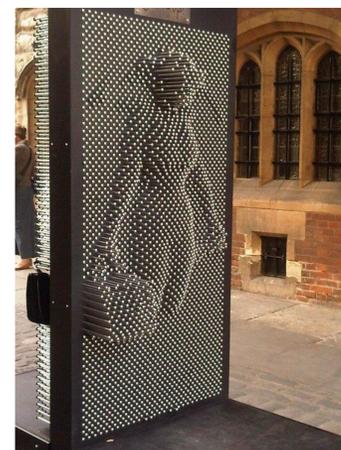
Bicycle Safety Project

Objective

The objective of the Bicycle Safety Project is to provide joggers and cyclist a sensor that can alert them of approaching dangers behind them. The dangers could be a mugger, a speeding cyclist, or approaching vehicle. The project initially approached the objective by using a camera to perform 2D image analysis such as optical flow and distance estimation. Optical flow was used for object detection and speed estimation. In addition to optical flow, the use of a 3D stereo cameras is used for object detection, distance calculation, and speed estimation.

In order to detect an object approaching the camera, the 3D stereo camera initially creates a point cloud to use as a distance reference. Then the point cloud collected afterwards is subtracted from the reference point cloud and then changes the reference to the new point cloud. The difference between the point clouds creates an impression that can illustrate moving objects similar to a pinscreen. The image is used to identify objects by using image segmentation. Image segmentation creates a binary filter that allows us to find the average distance and instantaneous velocity of the identified objects. From there, above desired speeds and their objects can be red flagged as dangers. The algorithm is able to calculate and identify objects in under a second when there is a single approaching object.

Proposed Scheme



Depth Image Processing Preparation

Reduce Field of View

Restrict Area of Interest

Generate Binary Filter

Depth Image Processing

Threshold Image by Range

Image Segmentation and Object Identification

Speed Estimation and Flagging

Experimental Results

Depth Image



Closest Object



Full Depth Segments



Background



Future Plans

- Experiment with low powered stereo cameras
- Expand capabilities of multiple object identification
- Increase background reduction to lower object flagging
- Improve speed estimation