Video Radar

Calculating the speed of an object in real time using a video camera.

Considered approaches

To build our system and application, we started off knowing we were going to need a camera, computer vision library, and:

- OpenCV
- ZED Stereo Camera: Two cameras side-by-side that parse depth by differences between the two images.

The Kinect

The Kinect is a camera device that was made by Microsoft for use with video games for their Xbox 360 games console. The Kinect has 2 cameras and a infrared laser projector. The first camera is a color camera for normal color view. The second camera is an infrared camera. The infrared projector projects a pattern of dots in front of it that the infrared camera then picks up. The Kinect then determines the distance depending on the pattern and spread of the dots.

Possible Applications

Our project could have several application in real life, tracking various subject, here are af few:

- Cars
- Athletes
- Sporting objects
- Analyzing crowds
- Animals

The Problem

The main method for people to track the speed of an object as they go by is to use a radar gun or laser gun, but unfortunately these methods have issues, they can only be used to check the speed of one object, the user can not tell exactly which object is being measured if there are multiple close together, and they must have an active user.

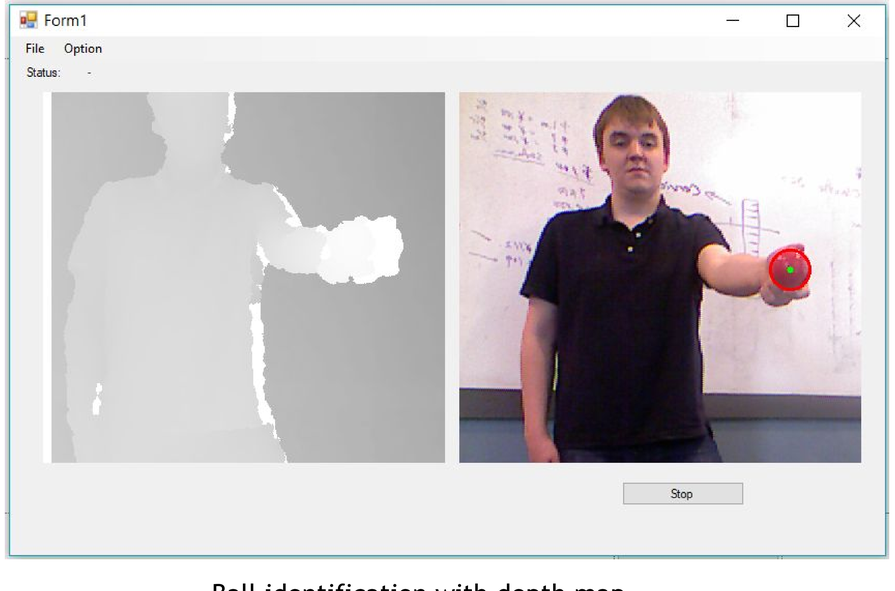
Our Process

First the Kinect camera calculates the depth map based on the infrared projections. Then it passes both the depth map image and the color image to our program. We then run an Emgu CV detection algorithm which identifies the red ball and its center. We then look up the distance to the center of the ball on the depth map. Next, we calculate the real world coordinates of the ball based on its distance from the camera. Finally, we calculate velocity based on change in position vs change in time.

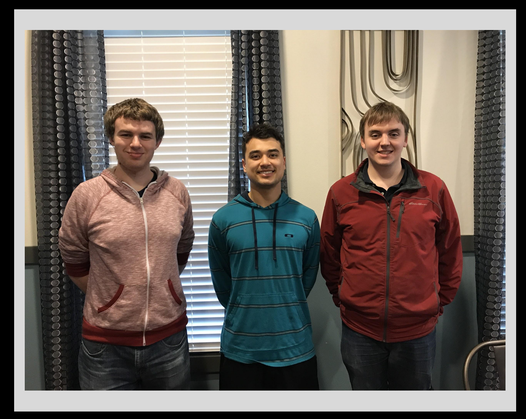
The Solution

Our solution to this problem is to use a camera in order to overcome these issues. For our proof of concept, we are using a Kinect camera. The use of the kinect allows us to measure the distance from the camera to an object so that we can track the velocity of objects. Since the video is being displayed the user can also see which object is going what velocity.

Our solution consists of a Graphical User Interface (GUI) application, which is made very simple for ease of use, that has a box that displays the live camera feed, where the objects that are being tracked are surrounded by a colored box. The velocity of the object is displayed in the text box to the side of the GUI. There is only one button that starts the camera and object tracking and stops it when clicked again. Our solution will also generate a comma separated text file so the user can review the data at a later date.



Ball identification with depth map



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Conclusion

- There are many different applications for this kind of system
- Efficient tracking methods are difficult to create
- To track different types of objects within one application there would have to be a different algorithm for each object which would be difficult
- Computer vision has endless possibilities

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