List of Suggested Projects for CSE 4392-5369  
“Special Topics in Vision-based Robot Sensing, Localiz. and Control”  
Prof. Gian Luca Mariottini, UT Arlington

Project No.1 - “Camera-based Multi-robot Tracking”  
**Abstract:**  
In this project, you will design and develop a strategy that allows a 
overhead camera to reliably detect and track multiple robots.  
The strategy must work in real time (C/C++) by means of the OpenCV 
libraries.  
**Notes:** A team of 2 people is recommended.  
**Keywords:** Computer Vision, OpenCV

Project No.2 - “Object Recognition for Wearable Camera”  
**Abstract:**  
In this project you will design and develop an object-recognition 
algorithm for moving wearable camera. You will use SURF-feature 
detector in OpenCV to reliably match the currently-observed object 
with the most similar database image.  
**Notes:** A team of 2 people is recommended.  
**Keywords:** Computer Vision, SURF

Project No.3 - “Gesture-based Robot Control”  
**Abstract:**  
In this project you will design and develop an algorithm for real-time 
hand detection and tracking. Depending on the position of the hand 
with respect to the head, the iRobot Create will turn left, right, move 
ahead or stop.  
**Notes:** A team of 2 people is recommended.  
**Keywords:** Computer Vision, OpenCV, Create iRobot

Project No.4 - “Assistive Robotic Platform”  
**Abstract:**  
The goal of this project is to use a camera mounted on the Create 
iRobot to detect, track and reach a colored object.  
**Notes:** A team of 2 people is recommended.  
**Keywords:** OpenCV, Create iRobot

Project No.5 - “Pedestrian Detection Algorithm”  
**Abstract:**  
Design a Histogram-of-Gaussian algorithm to allow a camera to detect 
in real time the presence of a pedestrian, and track him as he moves.  
Include a calculation of the distance to the pedestrian.  
**Keywords:** OpenCV, Computer Vision
Project No.6 - “Vision-based Interception of a Moving Target”
Abstract:
Design and develop an algorithm for vision-based interception of a colored moving target.

Notes: A team of 2 people is recommended.
Keywords: Computer Vision, OpenCV, Create iRobot

Project No.7 - “Augmented-reality system”
Abstract:
Design a software solution for creating an augmented reality system.

Keywords: Computer Vision, OpenCV,

Project No.8 - “Vision-based registration of a CAD model”
Abstract:
Implement a software solution to “attach” to a video the 3-D shape of an object being manipulated. As the object moves, the corresponding points are tracked in real-time.

Keywords: OpenCV, Computer Vision
Notes: A team of 2 people is recommended.

Project No.9 - “Range Sensor using an Omnidirectional Camera”
Abstract:
Design an omnidirectional camera (mirror+pinhole) to observe a wider field-of-view. Depending on some camera assumptions, devise a solution to compute the distance of the camera to specific objects.

Keywords: Computer Vision

Project No.10 - “Visual-hull Reconstruction Algorithm”
Abstract:
Design and develop a visual-hull reconstruction algorithm: using contours of an object extracted from an object rotated of a known angle, estimate the 3-D shape of the object.

Notes: A team of 2 people is recommended.
Project No.11 - “KLT feature-tracker for MATLAB”
Abstract:
Implement the KLT (Kanade-Lucas-Tomasi) algorithm for MATLAB and test it with a video sequence.

Keywords: Computer Vision, MATLAB

Project No.12 - “Cane-tracking algorithm from static camera”
Abstract:
Design and develop a overhead camera system that can measure the position and orientation of a white cane as it moves inside a room.

Keywords: Computer Vision, OpenCV
Notes: A team of 2 people is recommended.

Project No.13 - “Robotic White-Cane for the Visually Impaired”
Abstract:
Design and develop a robotic white cane that can be used to guide a visually impaired in an indoor environment (office, supermarket, etc.)

Keywords: Create iRobot, Robotics

Project No.14 - “Vision-based Indoor Navigation”
Abstract:
Design and develop a system that allows a robot equipped with a camera to navigate inside a corridor and avoid collision with walls.

Keywords: Computer Vision, Create iRobot, Control
Notes: A team of 2 people is recommended.