The main piece in a vision system is the sensor that retrieves visual data. Here we use a stereo-camera.

For the processing we have used a PC motherboard and installed Ubuntu 14.04 (a Linux OS distribution). It is basically a desktop PC with all the functionalities.

One of the main objectives in this project is to carry out all the processing on board. This PC motherboard along with the stereo camera and the enclosure weighs approximately 0.63 Kg, which is pretty heavy, but provides all the computational power required.

In this project we use stereo cameras instead of single cameras. They consist of two camera sensors attached to the same frame and parallel to each other. The setup makes it possible to perform different computer vision techniques, such as scene reconstruction, visual odometry, visual SLAM, and obstacle detection and location.

The code for this part of the project is written for DUO3D camera. This camera sends frames over USB, so it is relatively simple to retrieve images. OpenCV provides the VideoCapture class for getting images from generic USB cameras and the DUO3D stereo camera, Code Laboratories Inc. provides a specialised API.

The advantage of the DUO3D camera is that the two cameras are electronically synchronised, i.e., they take images at the exact same time. This is a required feature for scene reconstruction and visual odometry, because otherwise any small movement would make image correspondence erratic.

For the code of the vision system, we already had all the required header files and sample programs. As we proceeded with the installation of all the required drivers and other dependencies of the project, we found that the driver for which all the code was previously written had become obsolete with no official support from DUO, and that the current driver was not backward compatible with the previous ones. Hence, we had to modify all the code for the current driver, including the header files. Since there was an update in some of the libraries, we had to completely refactor a few parts of the code. The vision system is working properly now, although we are yet to check the working of the Point Cloud related functions. There seems to be a problem in linking the PCL and Boost libraries to the DUO + OpenCV code. We are working on that and will soon rectify it.