RAVEPC: Remotely Accessible Visualizer & Explorer of Point Cloud

An Interactive Visualization Application for LiDAR Data : Part II

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This document is a Part II of 3-part series of the user manual of our project, "LAN-based Interactive Visualization of Three-dimensional LiDAR Point Cloud", submitted to Department of Science and Technology (DST), Government of India. Part I comprises the instruction for installation and point reduction. Part II contains instruction for feature tracking and Part III includes procedure for remote visualization, and appendix section.

Software Description

RAVEPC is an open source desktop application for remote visualization of 3D range data. It can also be used to manually track the features in time-varying 3D range data. Currently, it supports las, ply and pcd data file format and is developed for Ubuntu operating system. It has server-client architecture where server should have high-end graphics card with all computational capability and clients can be used as thin devices for display purposes. User interface has been written using C++, fltk library and OpenGL. Algorithm is implemented using C++, PCL library and CUDA. Remote visualization is done using an open source product ThinLinc developed by Cendino AB. RAVEPC supports following features:

- RAVEPC is a stand alone desktop application for visualization and exploration of 3D Range data.
- It supports las, ply and pcd data file format.
- Points Classification into Geometrical classes
- Manual Feature Tracking up to 3 time-stamp data
- Remote visualization and analysis of the 3D range data
- Mesh Construction from unstructured 3D point cloud

Disclaimer

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3.1 Introduction

RAVEPC can be used for manual feature tracking of curve-graphs and surface clusters in time-varying data-set. At a time, feature tracking can be done only up-to three time-stamps data. First, user has to extract the curve graphs and surface cluster for all time-varying data set (maximum up to 3 time stamps) which is discussed in the chapter 2 and save the files with their corresponding file number. In the tool bar panel of the RAVEPC as shown in the Figure 3.1, select the point reduction option, then perform the segmentation and then save the features files with their corresponding file numbers. After has to manually tagged the features for all 3 time-stamps data and then play the tagged features.

To manually track the feature, user has to first tagged the feature using feature type and feature ID and then track them which is explained in the section 3.2. Following steps user has to perform to track the features:

Step 1 Open the file and perform point reduction and segmentation.

Step 2 Click yes in *point reduction done* option and then save the file by entering the correct file number. It will accept only 1, 2 or 3.

Step 3 Feature tracking can be done in up-to three time-stamps data. Repeat the step 1 and 2 for other two files also.

Step 4 Now open the $feature\ tag$ window by hitting the *tag* button and tag the features using features ID which is provided in $feature\ ID$ box and save them using *save* button for all three time-stamps data. User can iterate over the features using *next* and $PREV$ option.

Step 5 Now open the feature tracking window by hitting the *track* button and then press the *play* button on feature tracking window. This will play the tagged features in the video form.

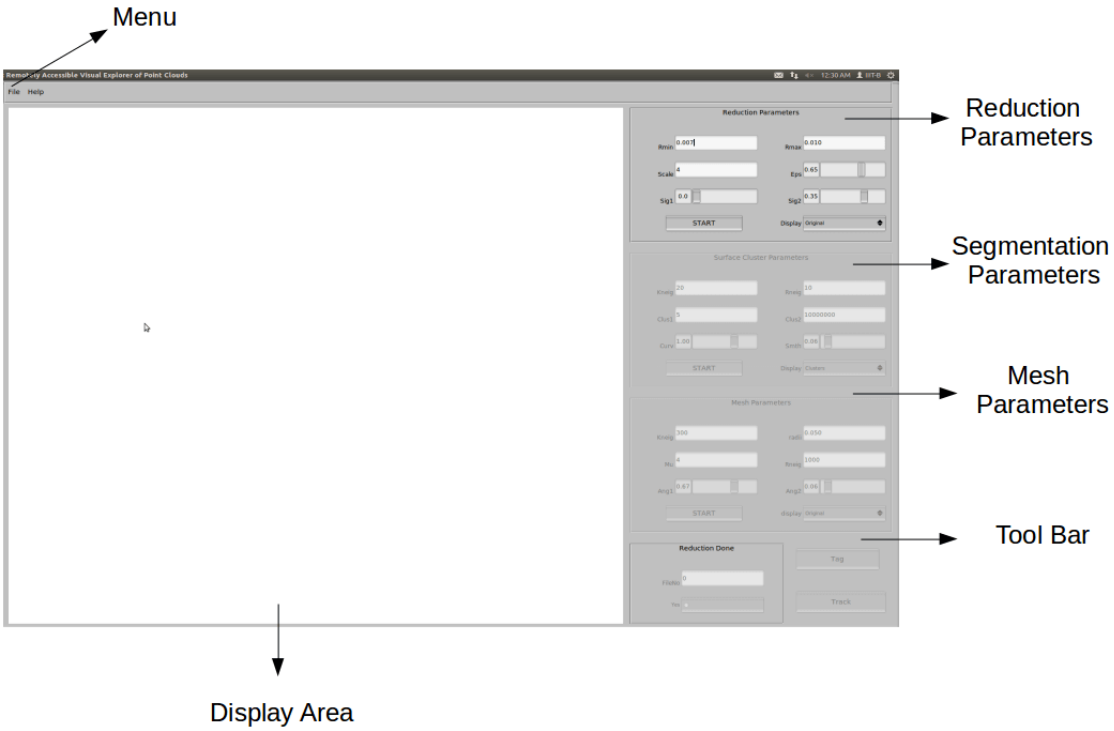

FIGURE 3.1: RAVEPC User Interface

3.2 Feature Tagging

To track the feature, user has to manually tagged the feature and saved them. Tag button in the tool bas area has been given as shown in the Figure 3.1 has to the window for feature tagging as given in the Figure 3.2. There are four options are available to change the display type: *original*, *reduced*, *line* and *surface*. User can use these options to view point cloud or features corresponding to all three time-stamps data in the same view and compare them. *Start* button is to reset the setting and display the original point cloud. To tagged the feature, user has to select the *line* or *surface* type option and then iterate over the features using the *next* and *previous* button. User can tagged the feature by selecting the *save* option. Figure 3.5 and Figure 3.6 show the steps to tag the surface clusters for time-varying data-set.

Figure 3.3 and Figure 3.4 show the original and reduced point cloud for three different time-varying data-set.

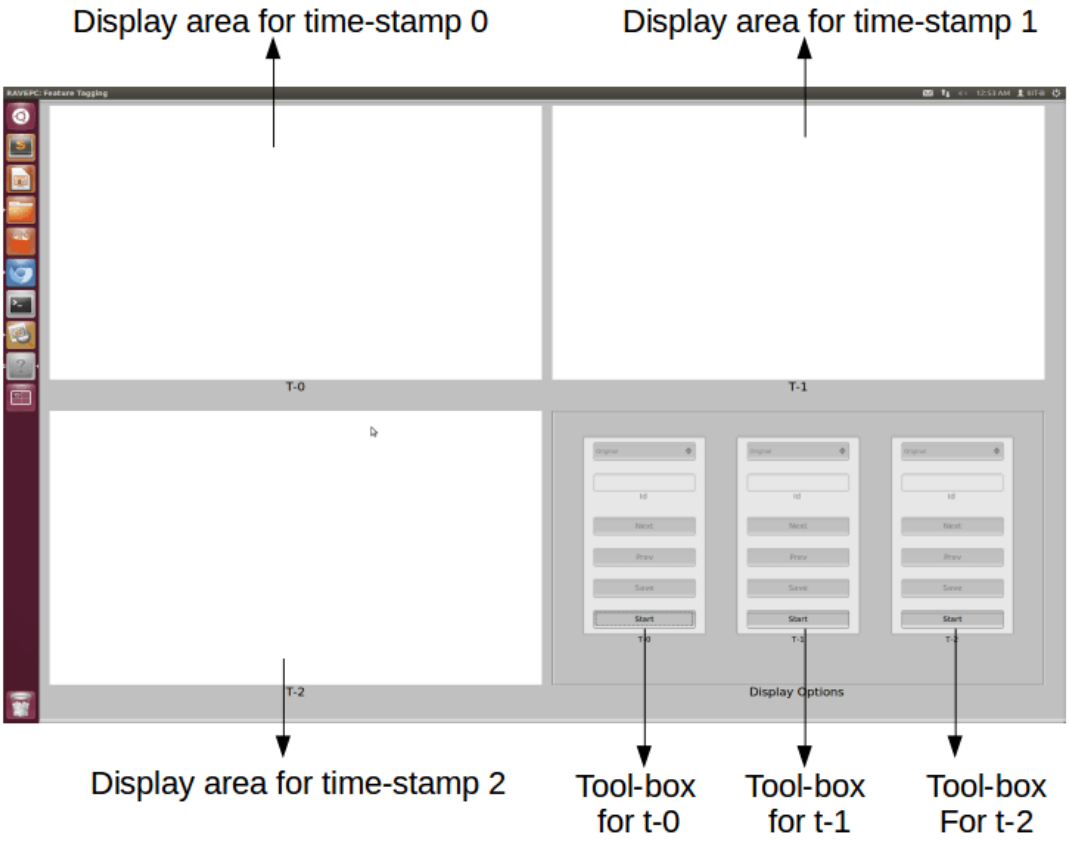

FIGURE 3.2: User Interface for Feature Tagging

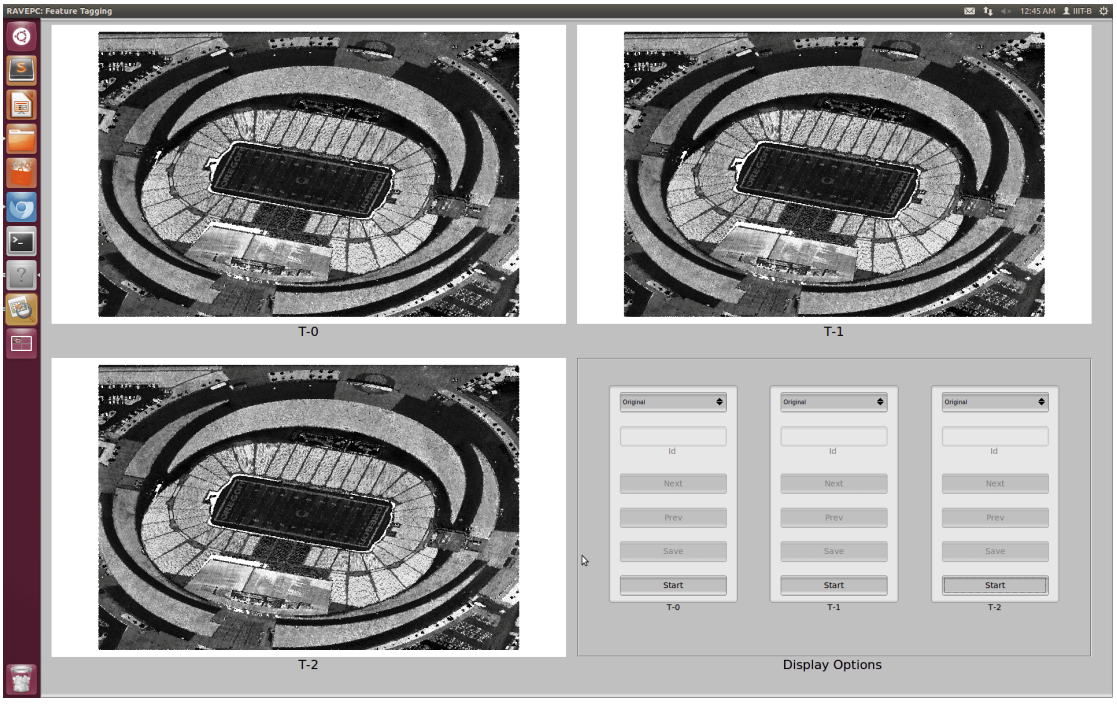

FIGURE 3.3: Original Point Cloud for all three time-varying data-set

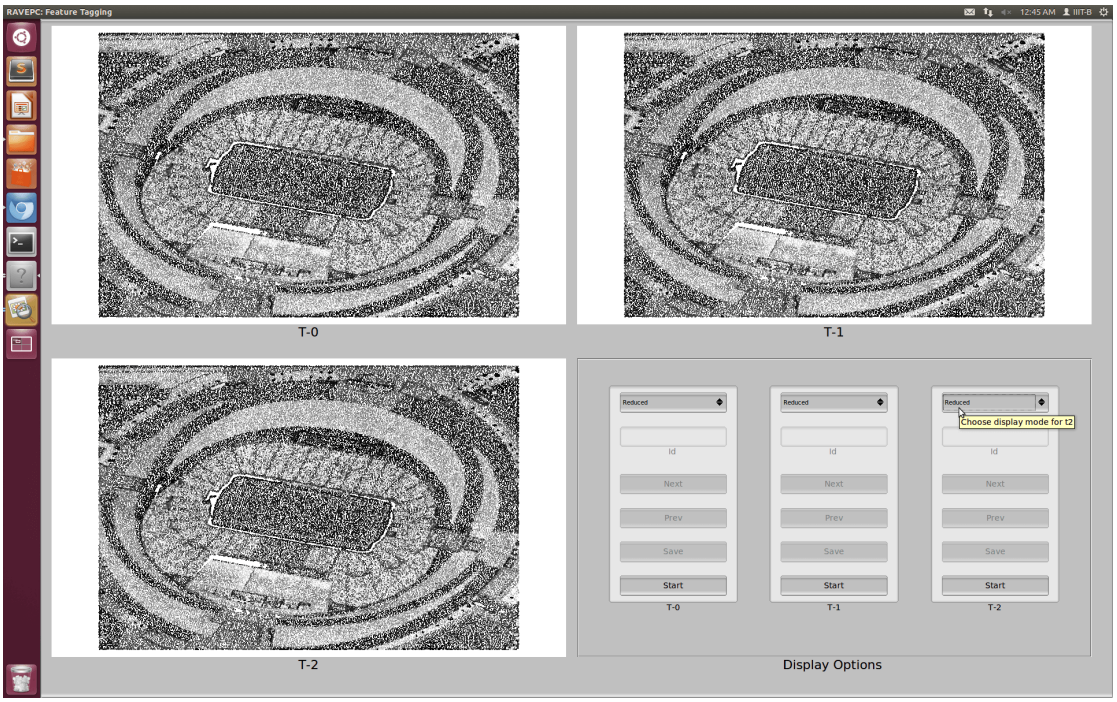

FIGURE 3.4: Reduced Point Cloud for all three time-varying data-set

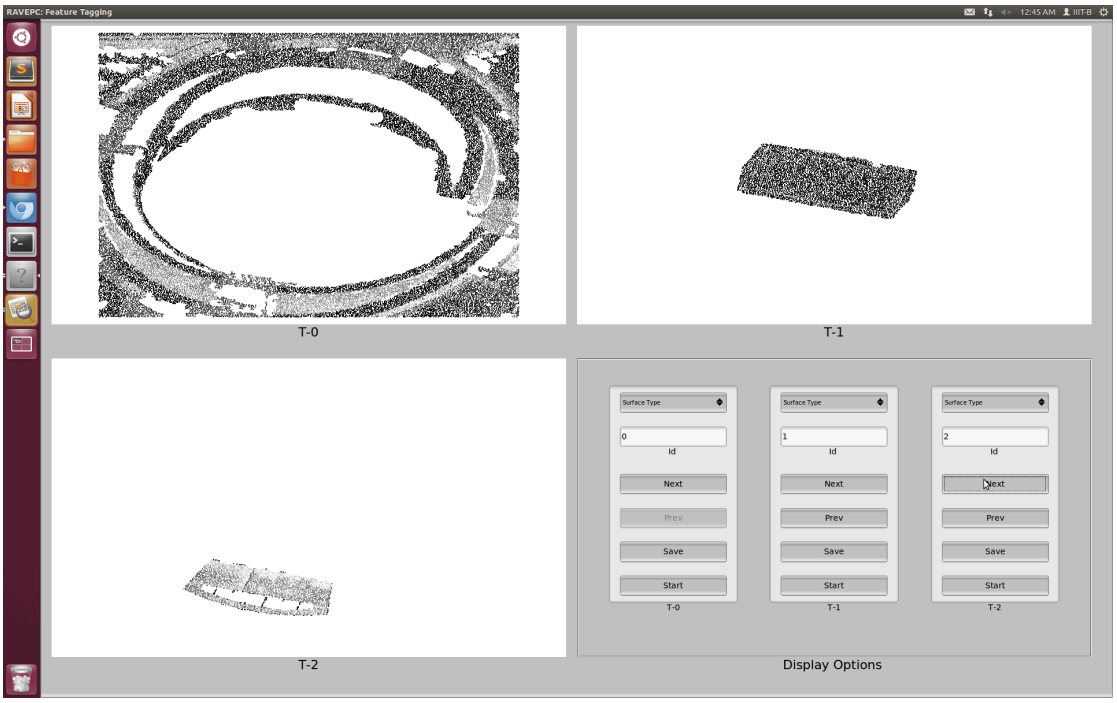

FIGURE 3.5: Surface clusters for three time-varying data-set

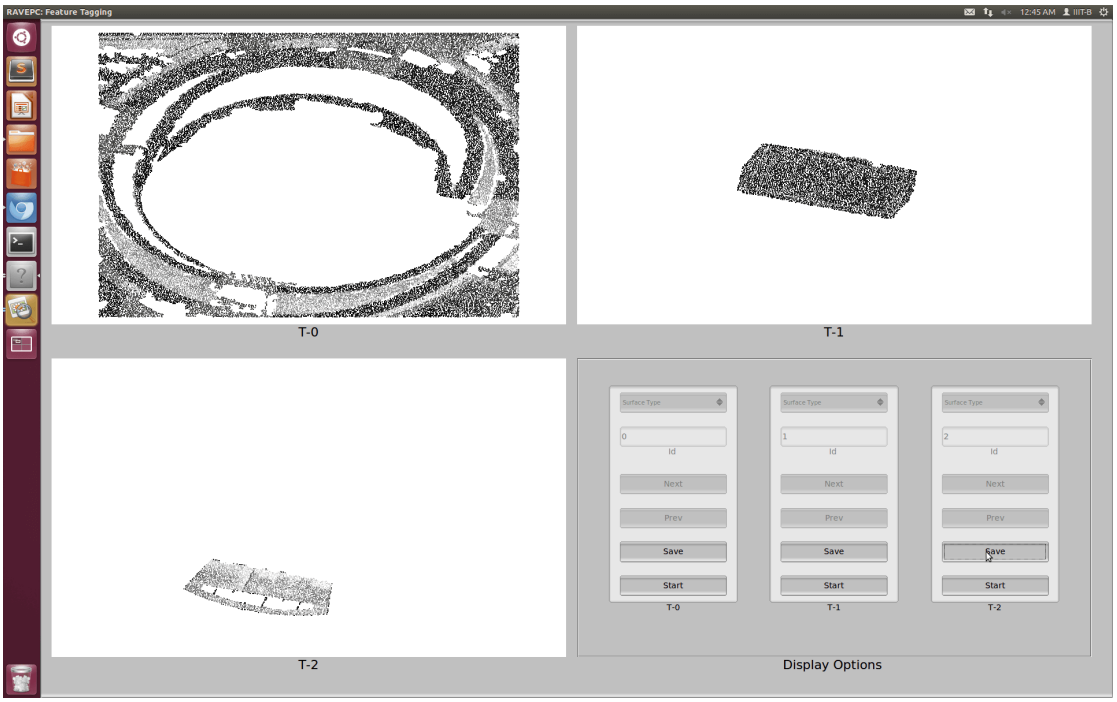

FIGURE 3.6: Surface clusters for three time-varying data-set. All the features are tagged by the user with the feature ID and saved

3.3 Feature Tracking

User can track the tagged feature in the form of video. Currently, feature can be tracked in the data-set up to three time-stamps. Therefore, there are only three frames for video and video will be repeated until user stop them. There is *play*, *pause* and *reset* option are provided as shown in the Figure 3.7. *Track* button has to select in the RAVEPC interface (Figure 3.1) to open the UI for feature tracking. Feature tagging has to be done before feature tracking and then user can press the *play* button in the feature tracking user interface to track the feature. In the Right area of the UI as shown in the Figure 3.8, there is a three sub-windows to display the time-0, 1 and 2 frame respectively .

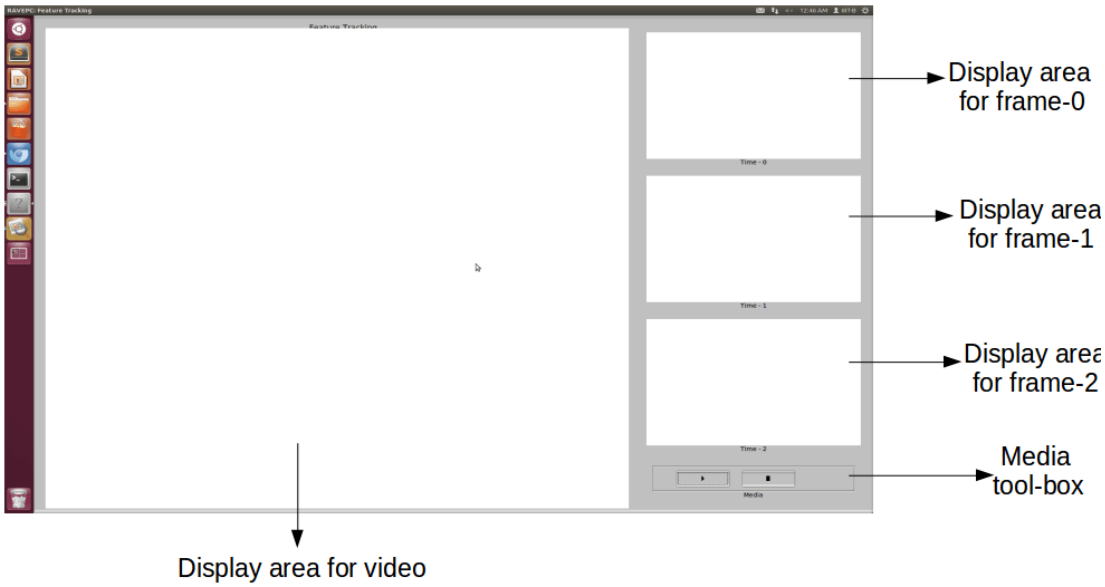

FIGURE 3.7: User Interface for Feature Tacking

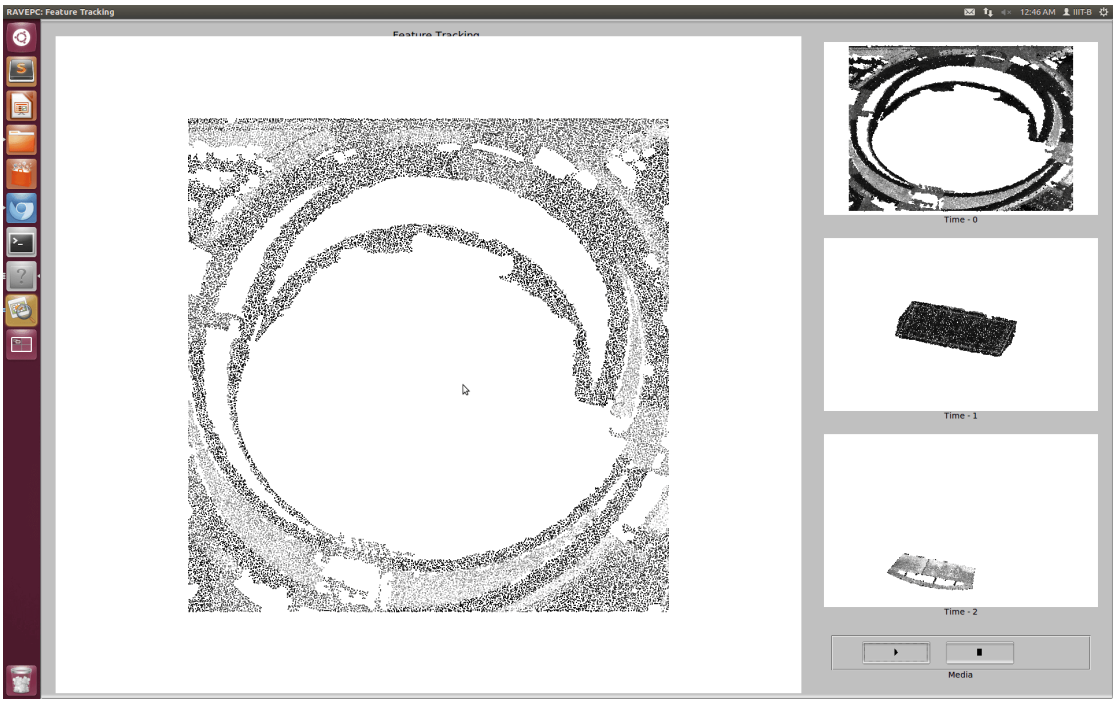

FIGURE 3.8: Feature Tracking in the form of a video