Work done by MD Facihul Azam:

1. Moving people detection from recorded video.
2. User Interface design for visualize the data.

Moving people detection: The program first detect moving people using state-of-art method, 'Gaussian mixture model ' and then it tracks the detected people. For detection Matlab computer vision toolbox ,
vision.ForegroundDetector is used. Gaussian mixture model (GMM) is a mixture of k Gaussian distributions (in this work k=3)that point the change of state of corresponding pixel from one frame to another frame. If the state does not change over consecutive frames, its value assign to 0(black) and if the state changes frame by frame , value assigns to 1 (white). Finally the colorful frame becomes binary image. The program is divided by different functionalites such as :
Matlab computer vision toolbox,

1. vision.ForegroundDetector segments the moving objects from background and outputs a binary mask where pixel value 1 correspond to foreground (moving object) and pixel value of 0 corresponds background. The first 40 frames are used to train the GMM and rest are used to detect object based on training frames. Number of training frames can be changed higher or lower value. In this case we select 40 since we use 150 frames for test the system.

2. vision.BlobAnalysis is used to find group of connected components of foreground as connected group of foreground pixel are likely to moving objects. Here minimum blob size is 70. It depend on how much camera height is.

3. Initialize tracks function keeps information of detected moving objects such as Id, bounding box , age etc. It keeps the information of moving objects which is being detected for a few frames called threshold. A variable visible count is set such that when it exceeds the threshold value (in this case it is 8 frames) system shows the bounding box around the moving objects.

4. detect objects function returns the centroids and bounding boxes of moving objects. And also it returns binary mask of similar size of the frame.

5. predictNewLocationOfTracks ,detectionToTrackAssignment and UpdateAssignTracks are use to predict centroid of of current frame, assign object detection in the current frame to existing track and update the track information correspondingly.

6. deleteLostTrack function removes information of the moving objects which is not visible for some consecutive frames. Here it is 20 frames.

7. createNewTracks function creates new tracks for unassigned detection.

8. displayTrackingResults function function draws a bounding box and label ID for each track on the video frame and the foreground mask. It then displays the frame and the mask in their respective video players.

User Interface design :

The User Interface (UI) consists of one axis to visualize data and four panels. Each panel consists of some functionalists. The UI first detects moving people from video file and save the information as a text file and also mat file for visualization. User can choose to detect video data according to day , for example Monday, Tuesday etc. Data will be saved according to day selected by user. For example if user select Monday , system will show only the detected results of Monday data. Same like others day.

Description of the panels:

Detect Panel: It consist only one functionality called ***load*** . It first loads the video files from the directory where files are saved. (In interface_version_1.m file , load callback function, path needs to change according to user.)Then it detects moving people from the video data (For testing we select only 1 minutes of data) and creates two directory namely **graphical_data** and textual**_data** at the same location where code exits or it can be some where depends on user. Before create directory it will first check whether any directory named **graphical_data** and textual**_data** exists. If no directory found, it will create them and save the data in those directories. If it finds the directory it will not create new directory and save data in those directories. graphical_data directory consists of mat file and textual_data directory consists of text file. Data will be saved according to selected day from DATA RANGE panel. For example if Monday is selected then data will be saved as monday.txt and monday.mat file.

SELECT DATA TO VIEW PANEL : This panel consist of four functional button to view results. User can select which day of the data they want to see. For example if Tuesday is selected then only Tuesday day will show. Same as other days. Functional buttons are as follows:

graphical data : It displays the result as a bar graph. It reads data from mat file stored in graphical_data directory and creates bar graph. X axis represents nodes or area or camera and Y axis represents number of people detected from each camera or node or area.

Textual data: It displays data as text format. It reads data from text file make it image file and display it to axis.

3D view : Data can be viewed in different time slots. For example user can divide everyday data into different time slots and view the results with 3D view. Where x direction is nodes , y direction is time slots and z direction is the number of people counted per node per time slot.

Reset : This button clear the axis . That is removes all the data from axis.

DATA RANGE PANEL: Here seven radio buttons exists each of which represents the day of a week. User can select the day which they wants to detect or see results.

SINGLE FILE VIEW PANEL : this panel consists of two components namely edit field and play button. User can see how system detects moving objects from video file. User needs to input the single video file name for example ' kampusareena.MP4 ' and click play button. It will display two window color video and detected objects with rectangle around the moving objects and labeled with counted number and binary mask player where only foreground object is white color and background is black color.

Conclusion: From the data it is obvious that Architecture and civil engineering student can get a lot information this project. User can see few information from the UI such as :

1. How much a node is used by people than others from graphical and also textual data. After that user

can identify which place popular than others.
2. User can see how a node is used by people in different time slots. For example from 3D view each node shows in different time slots and user can how nodes are used in different time periods in a day.

3. As data are saved by day basis. It is also useful feature to analysis data everyday basis. User can identify the busy day of the node or area.

In fact from a set of video file it is so difficult for a human to detect and count how many people are moving in a certain place and also time consuming. But software can do it very well. Our current detection algorithm is not perfectly detects moving people . It also give false detection but it is quit close to true value. Further research can improve the detection quality. Finally we can this system can save students and engineers time.