Continuous growth of population all over the world creates a great challenge to the transport management systems. The conventional methods are no longer effective enough for solving complex and challenging transportation management problems. More economical, more efficient and thus more intelligent methods have to be developed to deal with these challenging problems. Knowledge from different research areas is needed for developing these systems. Very often complex transportation systems require integration of different methods from different branches of science.

Due to the increased amount of vehicles, it is necessary to take effective steps in order to control the traffic and hence avoid all types of loses that is caused due to traffic. Once we have predicted a high traffic density for a network segment, we can initiate strategies to avoid this problem. In case of a road network, navigation systems can try to bypass the critical zone. Furthermore, any traffic control systems can inform the drivers...
about the traffic jam risk in order to guide them around the critical zone. In order to detect the traffic different sensors are being used and different techniques are used to determine the traffic and thus solve the problem related to traffic.

The study aimed at understanding the traffic issues and recommending improvements to facilitate smoother traffic flows. Population growth, vehicle ownership, socio-economic characteristics, and public transport facilities were among the parameters analyzed in the study.

Fixed sensors can generate high costs for setting up and maintaining the required infrastructure. It is also a disadvantage that such technologies, for practical reasons, have extremely limited local areas of use, so that a huge number of devices must be installed to determine the traffic situation in a wide area. Travel times are difficult to estimate with good precision, especially in urban areas.

Over last years, alternative technologies have emerged which seem able to overcome some of these problems. Collecting real-time traffic data by tracking vehicle position is one of them. Computer vision presents significant advantage over other traditional vehicle measurement technologies. Computer vision systems are more flexible, less invasive, and more precise, more robust, easier to maintain, produce richer information, do not affect the integrity of the road and offer as an added bonus, the possibility to transmit images for human supervision. Several video image processing systems for traffic density estimation are studied in this thesis and their advantages and disadvantages are discussed in detail. It has been identified that the existing methods are not suitable for Indian traffic conditions which is generally heterogeneous in nature. A new solution is proposed in this thesis which works very efficiently for Indian traffic and the experimental results demonstrates the same.
The study identified the following as contributing issues to the traffic problem:

1. Mixed traffic conditions
2. Encroachment resulting in reduction of capacity of roads
3. Lack of enforcement measures
4. Lack of engineering measures
5. Inefficient and inadequate mass transport system

The broad recommendations emerging out of the study included:

1. Planning should focus on reduction of the traffic load on existing road network through various travel demand management measures.
2. Emphasis should be placed on mass transport system
3. Concerted efforts are needed in removing encroachments, bottlenecks, improving traffic signal, road condition and geometrics at intersections.
4. Video image processing is recommended over other fixed sensors due to its high efficiency, easy installation and large experience base.
5. The proposed solution works well for Indian traffic conditions and can be quickly imported into any devices.

Our image sources include highly congested road sections in Bangalore, Chennai, Mumbai and Delhi where we gathered hours of traffic data in the form of image sources and collocated traffic video among several cameras. The evaluation results show our ability to successfully identify the traffic density in highly noisy images. The proposed system can be used in any traffic management solution towards real-time traffic density estimation and prediction.

Work still remains to be done in order to improve the computation time and efficient processing of video frames. Further enhancements are required in vehicle occlusion detection and classification.