A SURVEY ON TRAFFIC DENSITY MONITORING AND CATTLE MENACE ALERT SYSTEM USING IOT

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*Abstract :*Traffic management is becoming one of the most important issues in rapidly growing cities. Traffic jams and congestion is a common issue because of the increment of numerous vehicles. Congestion at times leads to delay and most of the time causes inconvenience to commuters. One more issue related to traffic jams is the Stray cattle are often found in the middle of the roads causing problems to commuters. Stray cattle roaming around freely in the cities have become a serious problem. The problem of stray animals, causing traffic blockheads and accidents on city roads is increasing day by day. A smart traffic monitoring system and cattle menace detection system can be one of the solutions to the above problem. This can be done by measuring the vehicular density on that road and wherein real time image and video processing techniques will be used. The main aim is to coordinate the traffic by keeping a check of its density at junctions and thereby controlling the traffic signal intelligently. For implementation, the system uses an image processing technique to analyze for a traffic condition. It detects how many objects or cars or animals on the road. And then, the system connects a traffic condition result on "ThingSpeak Channel". Moreover, it can be used to develop an alert once the cattle gets detected on the road. The proposed system uses a concept of Internet Of Things application platform 'ThingSpeak'. for analysis of traffic monitoring and for Cattle Menace Alert System. In this paper different ways for management of traffic and control are discussed in detail.

IndexTerms – **IoT, ThingSpeak, RFID, Raspberry Pi**

I. INTRODUCTION

Nowadays, the growing volume of the traffic all around the world requires higher levels of the traffic safety. Due to the ever-increasing traffic demand, modern societies with well-planned road management systems, and adequate development of transportation still faces the problem of heavy traffic .In response to growing traffic congestion on roads, a lot of research is being done ceaselessly to improve traffic conditions and new fields are explored to manage and improve traffic conditions In Modern Life we have to face with many problems one of which is traffic congestion becoming more serious day after day. It is said that the high volume of vehicles, the inadequate infrastructure and the irrational distribution of the development are main reasons for increasing traffic jam. It is necessary to efficiently manage the traffic flow by completely utilizing the existing capacity of the road. Modern Cities are facing a lot of trouble due to the traffic congestion. Increasing population results in subsequent increase in the vehicles causing congestion. In consequence, it takes more time to transport and a traveler feels stressed. One serious problem is the presence of cattle on the road. Stray cattle blocking the driveway triggers collisions and accidents. A smart traffic control system can solve these problems by continuously detecting and adjusting the timing of traffic signals according to the actual traffic load such a system called as intelligent traffic control system. An intelligent traffic control system reduces congestion; operating costs, increase the capacity of the infrastructure and provide cattle detection system.

In this paper, we will study the method which specially focuses on traffic management and control. Multiple mechanisms utilized for management of traffic and taking care of cattle menace discussed in detail. This brief survey presents various approaches for intelligent traffic systems. Further a model is also suggested for traffic monitoring based on the use of CCTVs and ThingSpeak "an IoT (Internet Of Things) analytics platform.

II. LITERATURE SURVEY

Many researches and works have been done on traffic analysis using image processing techniques. Various Traffic control methods are used for the betterment of controlling the traffic and to avoid traffic congestion Problems. In the field of IoT, many systems are proposed in order to control, manage the traffic system effectively. In the literature different control methodologies have been presented for controlling and managing traffic. The traffic monitoring and controlling is being researched and implemented through various means such as the use of image processing, RFID, wireless sensor networks, embedded system, GSM technology and Artificial Intelligence Techniques. In this section, different solutions for the better traffic management have been introduced,

2.1 Using Image Processing Techniques

In image processing techniques, the videos are captured by stationary cameras. Then images from the live videos are retrieved. Image processing is performed over extracted frames. The output obtained from the image processing algorithm is the number of vehicles.

In [1] author presented a technique which is based on the horizontal and vertical scanning of video frames to obtain accurate vehicle detection. Traffic congestion is measured in terms of traffic intensity which helps to ascertain whether the traffic at a given point is low, medium or high. Author used four main steps: The first step is to extract frames from video clips. Background subtraction is carried out in second step, which helps to identify the object in the foreground. In the third step the edges of the objects are identified which is implemented using raster differences. In the last step helps using bounding box and region props detected vehicles are get counted. Then the horizontal and vertical scanning is applied on all the frames one by one. Logical AND operator is applied to horizontal and vertical scanned frames. To generate the rectangular frames around the object Morphological operations like region props and bounding box are used. Using these frames author calculate and count the total number of vehicles and determine the traffic. The author in[2] presented a technique for the Traffic Congestion Investigating System by Image Processing Techniques. CCTV Camera is used to check a traffic condition. The traffic image from a CCTV camera is processed using image processing techniques.. After that, traffic congestion is found and got the results in three traffic conditions as Flow, Heavy, and Jammed. Finally the traffic condition data can be utilized for transportation planning or an intersection traffic control system In [3] development of a self-adaptive system is presented which can help in better traffic management using the technique of image processing. This paper demonstrated that as compared to traditional techniques, the image processing is a more efficient method of traffic control. Author proposed a system for controlling the traffic light by image processing. Here alongside the traffic light a camera will be installed. It will capture image sequences. Using image matching, reference image of an empty road, the captured images are sequentially matched. Her Prewitt edge detection operator is used for carrying edge detection and according to percentage of matching traffic light durations can be controlled.

Jiandong Cao [4], On the basis of computer and intelligent technology video image processing technology is presented and the prototype of a city intelligent traffic monitoring system is constructed. For collecting the information of road vehicles video monitoring system is utilized and using algorithm analysis is done for vehicle information which is then compared with the rules set by the system. a Recognition algorithm based on Haar features combined with AdaBoost classifier is used in this system. Author presented License plate recognition based on image processing and the process of key license plate location technology and character recognition has been established. Ling Hu and Qiang Ni,[5] presented a method of automated object detection for urban surveillance systems. In this method, from the digital camera imaging sensors the highest energy frequency areas of the images is determined and utilized for picking the vehicle license plates or the vehicles out from the images. From the digital camera imaging sensors, the proposed method searches the objects by filtering out the vehicle and/or license plate images. A simple filter to effectively detect either vehicle license plates or vehicles is designed by the author.

An approach for analysis and detecting vehicles in highways traffic images by means of image processing techniques such as background differencing, Otsu's thresholding and morphological filters is presented in [6]. Then Region and image Properties are used to count the number of objects in an image

2.2 Using Embedded System and IoT

Many systems are proposed in order to control, manage the traffic system effectively in field of embedded system and IoT. Each of the systems use different types of technologies, components for managing Traffic congestion like IR Sensors, RFID's, Zigbee, Traffic warning systems, Big Data, Bluetooth etc. Embedded PCs such as Raspberry Pi can also be utilized in IoT infrastructure.

Harshini Vijetha H, Dr. Nataraj K R. [7], presented a new approach for controlling Traffic System In the proposed system With components like Raspberry Pi, Pi-Camera, RFID, IR sensors an intelligent traffic controller is designed . Raspberry Pi is the main component which is used to control all, it acts like a controller. Tn this paper with the help of IR sensors density of the traffic will be decided. Using RFID technology, Green path (Zero traffic) is given to emergency vehicles and trailing of the stolen automobiles is also done..In [8] Bharath Kumar Perumalla, M. Sunil Babu presented a traffic and vehicle monitoring system based on IoT. Using ATMEGA 2560 microcontroller board, and AMICA Node MCU IoT board, and UBLOX NEO 6N GPS module system is constructed.. This system is capable of addressing problems such as traffic congestion, early warnings regarding jams, vehicle spotting, VIP and emergency vehicle clearance.

In [9] author presented a system by employing key technologies such as Internet of Things, Load Cells and RF Transmitters and Receivers. This system is used to collect, Store, Manage and Supervise traffic information. For internet based computing cloud is used, where different services such as server, storage and application are delivered to an organization. In this paper, to solve the problem of real-time monitoring and controlling road vehicles, time traffic information collection and monitoring system is proposed. P. Pyykönen, J. Laitinen, J. Viitanen [10],suggested a new model for applying the IoT (Internet of Things) to intelligent traffic systems. This system is implemented using road side units (RSU) with friction monitoring, vehicles with environmental sensors and a database for data transfer through different platforms. From stationary RSU stations or moving vehicles sensor data is collected and store it to the database for further processing or send them using 802.11p communication. To visualize measurements from vehicles and RSU a map interface for mobile devices is provided,

In[11] an IoT based traffic management solutions for smart cities where traffic flow can be dynamically controlled through Internet is proposed. Onsite traffic officers use their smart phones to centrally monitor or control traffic flow using Internet. By utilizing Raspberry Pi , the single board computer (SBC) attributed with networking features, the proposed dynamic traffic signal controlling model is constructed. he authors in [12], to determine the amount of vehicles on that road a system with algorithm is

presented ,in which the camera will send the captured video to the Raspberry Pi board. Raspberry Pi processed the videos captured by the camera .The Raspberry Pi board will update this information on the server. Then the traffic signal will be controlled smartly by comparing the vehicle density and the direction of the traffic.

Pratishtha Gupta, G.N Purohit, Amrita Dadhich[13],presented intelligent traffic system using CCTV cameras and WAN. In this survey paper various approaches for intelligent traffic systems like Geographical Information Systems, Artificial Intelligence, Graph Theory and Real time Systems are presented. In [14], the solutions for Traffic congestions using the concept of networking and embedded systems are explained. Author designed a alert system using Raspberry Pi, Routers, Ultrasonic sensor and E-Mail servers. The author in [15] proposed Road Traffic Congestion Observing and Measurement using Active RFID and GSM Technology. To monitor traffic and detect congestion, author developed a Traffic Monitor system makes use of RFID enabled probe vehicles. This system use roadside active wireless devices to collect signals from active RFID tags attached to the probe vehicle. The implemented system trace the travel time of probe vehicle as it passes the roadside devices, create an average trip time.

2.3 Using Artificial Intelligence Techniques

Nowadays Artificial Intelligence techniques being applied in a large variety of fields including traffic management and control. It becomes the research hotspot in this area to apply artificial intelligence methods to urban traffic signal control system.

In [16], in order to elicit general diagnosis for the traffic congestion problem in Kuala Lumpur and Kuantan, author presented a new Artificial Intelligence Techniques (AIT) and Simulation Model (SM),. Author developed a model which involves a Neural Network (NN), Fuzzy Logic (FL), Genetic Algorithm (GA), and Simulation Model (SM) .The current traffic demand data will be captured by strategically placed cameras. They plan to use their integrated model to adjust traffic lights timing to optimize traffic flow in coordinated traffic lights systems by receiving and processing data. The proposed work done is also used to minimize the traffic congestion through controlling traffic lights.

In [17] an advanced traffic management system , implemented using Internet of Things (IoT) was developed. Here embedded circuit which operates using RFID with clustered systems is used the vehicle,. For working with big data analytics, Hadoop is presented. Here supervised learning methodologies are proposed that would help in determining the standard of roads, estimating overall traffic flow, calculating average speed of distinct vehicle types on a road and analyzing the travel path of a vehicle.

In [18] Zhiyong Liu aims to develop a Traffic System that can respond to traffic demand and optimize online timing plans. Author presented AI methods such as fuzzy logic, neural networks, evolutionary algorithms and reinforcement learning for traffic control. Shruthi K R and Vinodha K[19],presented Priority Based Traffic Lights Controller Using Wireless Sensor Networks. Author uses Wireless Sensor Network (WSN) as a traffic light controller. To define route of emergency vehicle, the System is implemented with the use of fuzzy logic.

2.4 For Cattle detection

Different techniques for detection and tracking of animals have been used by many researchers.
In[20] author proposed WSN based system for wildlife management in the surrounding area of human passages to establish safe ways for animals to cross transportation infrastructures. The detector circuit is designed using pir-based motion detectors. These detectors are used to detect the presence of an animal. If the animal enters, the road side IR sensor senses it and traffic signal is automatically switched to red signal with the help of pic. Microcontroller manages the traffic and generates control The information about the status of the roadside is sent to the traffic module, using Zigbee. If the animal stays on the road for a longer duration, an alert/warning signal will be generated on the road using a buzzer and flash light.

In[21],for animal detection author discussed animal detection using viola and jone algorithm. In this paper, videos are captured by camera and converted into frames. After finding the different images, a database for Positive and negative images is created. In Positive images correspond to image with detected animal and negative images correspond to image with non detected animal. HAAR Transform is used for feature extraction. After that training the Haar feature using Opencv the XML file is generated. Using this xml file author tested the video and got the output with detected animal .

In [22] a simple and a low-cost approach for automatic animal detection on highways for preventing animal-vehicle collision using computer vision techniques are proposed. More than 2200 images consisting of positive and negatives images are tested on various video clips of animals for training of the proposed system. In this paper, algorithm for animal detection based on HOG and cascade classifier is discussed. The algorithm can detect an animal in different conditions on highways. In [23], to detect the animal presence using the web camera and for identification of dangerous animal a animal detection system is proposed. If the animal is wild, the safety automatic animal detection and warning system is developed to warn the people. Here for object detection CBRA (i.e. Content Based Retrieval Algorithm) is used. By using algorithm animal can be differentiate according to size, shape, color, etc. If the animal is wild animal, then the system should give alarm.

III. FUTURE RESEARCH ISSUES

In the above section we have discussed the multiple researches method which process images and track vehicles and focus on improving the traffic conditions and cattle menace detection, To have better traffic control ,by utilizing image processing and IoT application platform "ThingSpeak" a new development model is suggested.

3.1 Suggested development model

According to my proposed work, the data related to traffic will be captured using camera. After getting a brief view related to traffic condition, total number of vehicles will be calculated and presence of animal on the road will be detected by Image

Processing from CCTV Camera. The analysis of traffic monitoring will be done using ThingSpeak Channel. The analysis of traffic monitoring and cattle menace will be done using ThingSpeak Channel. If Cattle is detected the alert message will displayed on the server.
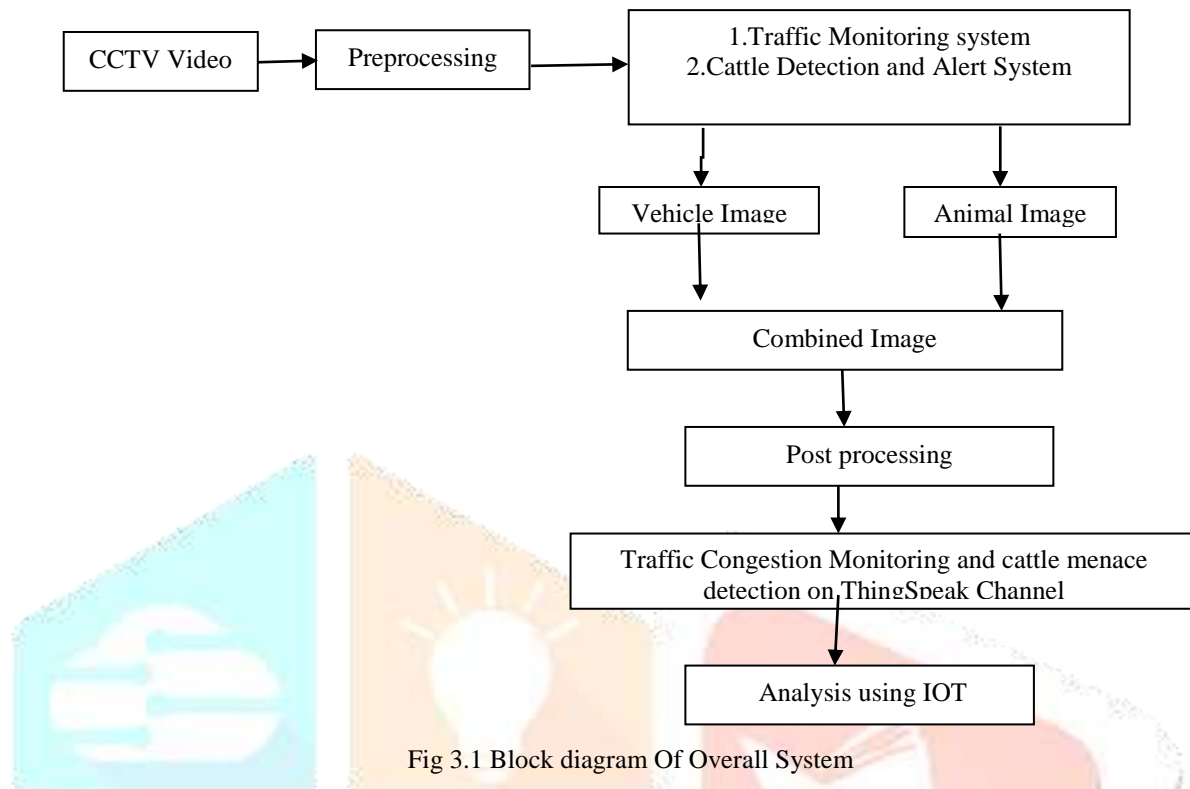

Fig 3.1 Block diagram Of Overall System

The camera will be located near the junctions. It will capture videos of the traffic coming from a particular direction. These videos are splits in the form of frames .The videos which are captured by the camera will be processed here The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhances some image features. Segmentation or contouring could be also obtained using morphological operations. Segmentation subdivides an image into its constituent regions or objects. To detect the shape of the object, the segmented image undergoes a series of morphological operations. Morphological image processing is a collection of non-linear operations related to the shape or morphology of features in an image. Region and image Properties are used to analyses the number of objects in an image. The number of objects seen in the image will be counted.

For cattle detection analysis and classification ,image feature extraction methods such as HAAR Transforms, LBP (Local Binary Pattern), HOG (Histogram of Oriented Gradients) and other methods that focus on detection of an object will be used.. Once features have been extracted the algorithm like SIFT,SURF or BRISK will be applied to identify the animals. When the animal is detected the calculated result is given to the alert system.

After this for traffic monitoring analysis and cattle menace alert we are going to use "ThingSpeak", an IoT (Imternet of Things} analytics platform. ThingSpeak is a platform providing various services exclusively targeted for building IoT applications. It offers the capabilities of real-time data collection, visualizing the collected data in the form of charts.

IV. CONCLUSION

In this paper, various traffic management techniques have been studied. This survey helps in identifying all possible traffic management methods in smart cities. The survey of various traffic management schemes concludes that the traffic controlling systems, automatic traffic density estimation can be carried out by some artificial vision technique which uses Image Processing for implementation and IoT solutions in the area of Smart City to solve traffic congestion problems

In this paper by using IOT we are going to develop a system to Measure, explore, discover traffic patterns and Provide live local traffic information service. The method used above for detecting the density of vehicles, cattle menace can be used for controlling the traffic, avoiding traffic congestion, accidents, etc. Using this method at each crossway could help in a hindrance free journey for travelers Also, the signals will be monitored and the status of the traffic signal will be updated at the server. Cattle menace will be detected and the information will be communicated to respective agency.

V ACKNOWLEDGMENT

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