# SMART MAT - People Counting Information

Prof.M.D.Nikose[1], Aishwarya Nagare[2], Nikita Naikwadi[3] , Sonali Satalkar[4]


[1]*(Assistant Professor E&TC) Sandip Institute of Technology and Research Center, Nashik, Maharashtra, India*

[2] *Bachelor of Engineering, Sandip Institute of Technology and Research Center, Nashik, Maharashtra, India*

[3] *Bachelor of Engineering, Sandip Institute of Technology and Research Center, Nashik , Maharashtra, India*

[4] *Bachelor of Engineering, Sandip Institute of Technology and Research Center, Nashik, Maharashtra, India*

## ABSTRACT

*Abstract— Real time data for the movements of people are an important input for decision-makers of regional or premises planning. It allows counting the number of visiting people in particular premises and people remain in the premise along with incoming and outgoing count of people in real time by using pressure mat. Moreover, it gives information about mishap in same premise to the control room by sending a message via GSM. This makes easy to handle or control such adverse situation.*

**Keyword :** *Keywords—Pressure mat, GSM*

## I. Introduction :

Accurate and representative mobility data, especially for monitoring traffic is a vital information for our daily life. So the aim of this project is to expand the security measures to handle the crowd which is a requirement at public places for safety and security. For such a system to work for prolonged period of time in a premise where there are more chances of mishap, stampede, etc. Many times it found difficult in adverse situations to get the count of stranded people and the number of people visited that place. This project is helpful to get actual number of people visited to particular place and the number of people those are in danger and make it easy to save their lives.

Manual people counting's using some sort of tally counter are still frequently performed in practice to gather information on the non-motorized traffic patterns. especially since almost no installation/setup overhead is required. For longer durations or dense traffic, however, the data gathered using a manual approach is often either not representative or inaccurate. To overcome this issue, many automated people counting approaches exist.

Respective mobility data for non-controlled traffic, so far, is primarily used by operators of infrastructures like railway stations, airports or shopping malls for various optimizations. For example, using this data one can optimize train schedules and respective transfer times to enhance the attractiveness of public transportation. Likewise, a shopping mall operator can influence the habitual buying behavior and thus better the overall property

value. The same data can be used for safety measures in public buildings or at large events by, e.g., restricting access to certain regions when the number of people exceeds the respective capacity. There exist a multitude of automated people counting technologies, see, e.g., [2], [5], or [12]. At present, however, none satisfies all the diverse requirements commonly encountered in practice.

An automatic people-counting system in real time is important in several application areas where the activity of people needs to be analyzed or monitored [12]. If we get the number of visiting people for a period, it is easy to manage and control people and special areas such a building, a park and most of systems are based on a camera, the existence network such as the Internet, and use an electric power including a wire power line. Also, some systems are for indoor such as at gates, at entrances of buildings and so on [14].

In recent years different technologies for counting people have been developed and used. The following list gives a short overview and provides an informal assessment of the respective strengths and weaknesses  Counters based on active infrared sensors are typically low-cost, have low power consumption, allow for a simple installation and are portable. These devices, however, are not able to discern between pedestrians and other moving objects (e.g., raindrops) and cannot separate multiple pedestrians crossing a given line-of-sight at the same time.

Passive infrared counters, see e.g., [7] and [8], using thermal images are available at moderate costs, feature low energy consumption and are operable in humid or foggy weather conditions. Furthermore, these systems are legally defensible with regard to data privacy. Drawbacks of these devices are their rather limited usability in dense traffic situations, the requirement for over-head installation, the limited co, see [3]average of widths where counting is feasible and their dependence on temperature differences. Better counting accuracy is obtained by relying on laser scanners, see [13], [6]. These counters work reasonably well even in crowded areas, allow separation of individuals, usually are simple to setup and can operate on wider cross sections. Their drawback is mainly due to the high initial costs, their limited usage under different weather conditions and their rather bulky and heavy construction.

Vision based counting solutions, see [8], [10], can operate on larger cross-sections, and give somewhat accurate results – some even under varying lighting conditions (stereo vision based systems) and when recorded allow for further postanalysis. These systems are usually simple to setup and require only moderate installations. Drawbacks are influences of the operation on different environmental conditions, legal issues with respect to data privacy, and are often only available for indoor scenarios.

A detailed overview and evaluation of existing people counting solutions was presented in [1] and [4]. Despite all the advances, manual counting's using tally counters are still used most of the times, see [3], [4]. For small samples this method is cost-effective and allows high accuracy for low traffic densities. However, bidirectional counting's, higher people traffic densities, and the short time-spans that can be covered in this way limit this method.

This project is to expand the security measures to handle the crowd which is a requirement in crowd places for safety and security. For such a system to work for prolonged period of time in a premise where there are more chances of mishap, stampede, etc. Many times it found difficult in adverse situations like stampede, fire accidents etc. to get the count of stranded people and the number of people visited that place. This project is helpful to get actual number of people visited to particular place and the number of   people those are in danger and make it easy to save their lives.

This system sends message to the control room when number of people exceeds beyond the capacity of the premise. This makes it easy to handle crowd efficiently avoiding stampede issues. It again sends a message without any delay to control room when there can be chances of mishaps.

In these paper we are proposing system which gives information about people counting and mishap in same premise to the control crowd by sending a message via GSM. This makes easy to handle or control adverse situation.

## II. DETAIL BLOCK DIAGRAM :

The project consist of Pressure mat,fire sensor, GSM and LCD interfaced with ARM7 processor. The pressure mat is the main element of the project, It is used to count incoming and outgoing people at the particular premise and this count is displayed on LCD. The fire sensor is used to detect the flame and this information can be sent to the control room or fire extinguisher via GSM.
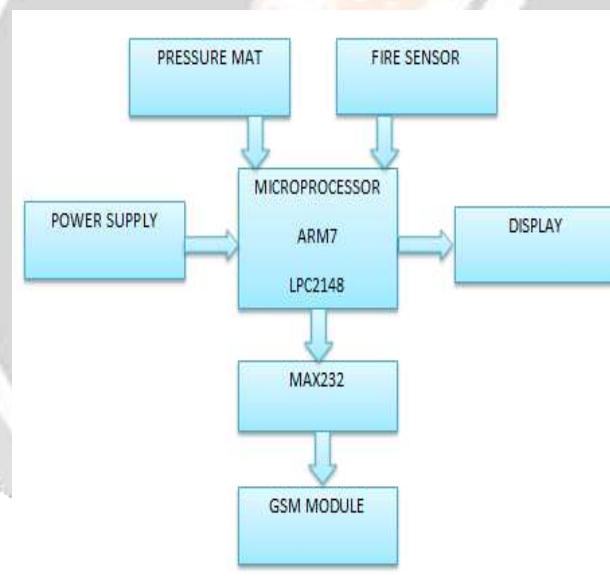


**FIG . 1** BLOCK DAIGRAM

The pressure mat will be placed at the entrance of the premise which detects the number of incoming and outgoing

people then controller increase the count by one when firstly inner most switch is pressed then incoming count will be increase,and if outermost switch is pressed first then outgoing count is increase. Simultaneously processor calculate the number of people remain in the premise. So that control room can be aware of the number of people actually present at the instant of time. The processor analyze the crowd at a particular place,if the count of the people exceeds the capacity of that particular premise the signal will be conveyed to the control room via GSM.

The use fire sensors which will detect the flame and if flame or fire detected then the it inform processor and processor interfaced with GSM send message to the fire extinguisher to control the situation.

### III. PRESSURE-MAT FOR PEOPLE COUNTING :

The pressure mat will be placed at the entrance of the premise which detects the number of incoming and outgoing people. The pressure mat is made up of matrix of switches and material used is Vellostat. Depending on which switches are pressed it senses in and out direction i.e., it gives bi-directional counting. It is easy to use, very flexible and like modular system.

The use fire sensors which will detect the flame and if flame or fire detected then the it inform processor and processor interfaced with GSM send message to the fire extinguisher to control the situation.
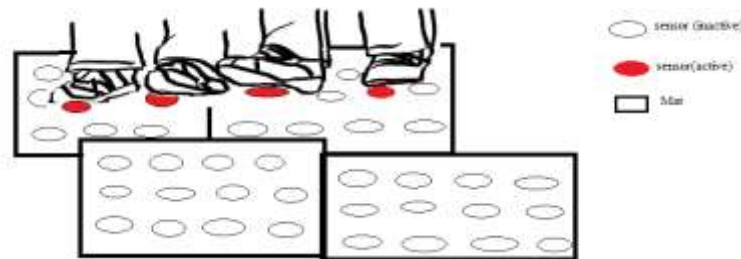


**Fig -2**: Pressure Mat

### IV. FIRE SENSOR :

Fire sensor is sensitive to the flame and radiation. It also can detect ordinary light source in the range of of a wavelength 760nm-1100 nm. The detection distance is up to 100 cm. The Flame sensor can output digital or analog signal. It can be used as a flame alarm or in fire fighting robots.



Fig 3.Flame sensor

The use fire sensors which will detect the flame and if flame or fire detected then the it inform processor and processor interfaced with GSM send message to the fire extinguisher to control the situation.

### IV. GSM :

Here we used SIMCOM module which is ultra compact and reliable wireless module.The SIM900 is complete dual-band GSM module in SMT type.and it is small dimensions and cost effective solutions.It delivers 900/1800 performance for voice, SMS ,Data and Fax in a small form factorand with low power consumption.and its fit to our requirement as it is in compact design.It compatible for AT cellular command interface.

Fig 4.GSM Module

## V. METHODOLOGY :

Our system which information about people counting by using pressure mat.and mishap in same premise to control crowd by sending a message via GSM and fire sensor. project is to expand the security measures to handle the crowd which is a requirement in crowd places for safety and security. For such a system to work for prolonged period of time in a premise where there are more chances of mishap, stampede, etc.

Algorithm:

After system turn on all the IO ports, UART, LCD and the ADC of Processor will initialize. Set all ports as input or output as required. Monitor all the IO pins interfaced with the pressure mat. As the switches gets pressed, depending on the which switches are pressed it will increment or decrement the count of people enter or exit the premise .Simultaneously it will calculate the net count. If IN COUNT greater than OUT COUNT then NET COUNT will be calculated by subtracting OUT COUNT from IN COUNT. Also this NET COUNT will compare continuously with SET value of premise or hall capacity and GSM interfaced with processor will send message to control room if NET COUNT exceed above the SET value. All these count information will displayed on the LCD in real time. It will monitor the flame sensor output and will send message to control room via GSM if flame is detected in that premise.

Flowchart:



**The following functional requirements will be addressed in our project:**

(1) Mat to identify people crossing in any direction - It can control both direction count in and out.

(2) Multi-directional counting's - It can measure indoor and outdoor count of people simultaneously.

(3) High accuracy - As the mat sense pressure of foot and then provide incremented count.

(4) In mat the Vellostat material used that provides a reasonable load and pressure distribution as provides the output as resistivity decreases.

(5) small weight - As mat made up of simle switching principle with vellostat material.

(6) Minimum installation and maintenance - As it is very much flexible to handle and ease to use.

(7) Useful for in- and out-door applications (waterproof, wide temperature range, robustness)

(8) Safety related features (skid-proof, small mat heights, markings, etc.)

(9) Low cost

## VI. CONCLUSION :

This project presents a report on smart mat that will eventually facilitate an automated counting of peoples traversing the mat. And detect mishap like fire accident. The approach has the potential for use even in dense premise both indoors and outdoors and will eventually provide a solid data basis for regional planners.

## VII. FUTURE SCOPE :

After designing the people counting system it gives the accurate output but with known error but there is probability that we can improve our system by using the efficient mat which gives instant output and to add more security we can use digital image processing to know which person enters in premises

## VIII. APPLICATION :

**Shopping Mall**: To count the attraction factor of the customers towards mall. and to count how many people are visited to mall in particular season.

**Home security**: To provide additional security for home scenario.Human locations collected from a sensor network deployed inside a house are processed together with building map information to recognize the activities of the house inhabitants

**Stadium**: To know how many persons entered the auditorium. system which can count the number of visiting people and sense environment information to protect an ecosystem.

**Fall risk management:** it is the medical application automatically generates the report of patient progress towards measurable goals.

## IX. References :

[1] Bu F., Greene-Roesel R., Diogenes M.C., and Ragland D.R.:"Estimating Pedestrian Accident Exposure: Automated Pedestrian Counting Devices Report", Transportation Research Report (TRB 2007), p. 31, March 2007.

[2] Crabtree M.R.: "Smart pedestrian counter system" (SPECS),11th International Conference on Road Transport Informationand Control, pp. 100–104, 2002.

[3] Diogenes M., Greene-Roesel R., Arnold L., and Ragland D.:"Pedestrian counting methods at intersections: A comparativestudy", Transportation Research Report (TRB 2007), p. 12,April 2007.

[4] Greene-Roesel R., Diogenes M., Ragland D., and Lindau L.: "Effectiveness of a commercially available automated pedestrian counting device in urban environments: Comparison with manual counts", Proceedings of the 2008 Transportation Research Board 87th Annual Meeting: Conference Recordings,

[5] Gasparini L., Manduchi R., and Gottardi M.: "An Ultra-Low-Power Contrast-Based Integrated Camera Node and its Application as a People Counter", Seventh IEEE International Conference on Advanced Video and Signal Based Surveillance(AVSS), pp. 547–554, 2010.

[6] Huijing Z. and Shibasaki R.:" A novel system for tracking pedestrians using multiple single-row laser-range scanners",IEEE Transactions on Systems, Man, and Cybernetics, Vol.35, Iss.2, pp. 283–291, 2005.

[7] Hao Q., et al: "Human tracking with wireless distributed pyroelectric sensors", IEEE Sensors Journal, Vol. 6, No. 6, pp.

[8] Li N. and Hao Q.: "Multiple walker recognition with wirelessdistributedpyroelectric sensors", Proceedings of SPIE Defenseand Security, pp. 694034(1-12), March 2008.

[9] Rabaud V. and BelongieS.:"Counting Crowded Moving Objects", Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp. 705–711, 2006.

[10]Teixeira T. and Savvides A.: "Lightweight People Countingand Localizing in Indoor Spaces Using Camera Sensor Nodes",ACM/IEEE International Conference on Distributed SmartCameras, pp. 36–43, 2007.

[11]Zhao H. and Shibasaki R.: "A Real-Time System for Monitoring Pedestrians", 7th IEEE Workshop on Application of Computer Vision (WACV/MOTION'05), Vol. 1, pp. 378–385, 2005.

[12] Zhu Q., Tang L., Jiang Y., and Deng W.:"A novel approachof counting people based on stereovision and DSP", The 2ndInternational Conference on Computer and Automation Engineering (ICCAE), Vol. 1, pp.81–84, 2010.

[13]Segen, J., Pingali, S., "A Camera based System for Tracking People in Real Time," IEEE Proc. of Int. Conf. Pattern Recognition. 3, pp. 63–67, 1995.

[14]1Byung-rak Son, 1Seung-chan Shin, 1Jung-gyu Kim, and 2Yong-sork Her "Implementation of the Real-Time People Counting System using Wireless Sensor Networks"1School of Computer and Communication Engineering, DaeguUniversity, Korea2Gumi Digital Electronics Industry Promotion, Korea