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# **E-PROCEEDINGS**

## **INTERNATIONAL TINKER INNOVATION & ENTREPRENEURSHIP CHALLENGE (i-TIEC 2025)**

"Fostering a Culture of Innovation and Entrepreneurial Excellence"



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**PTDI, UiTM Cawangan Johor**  
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**ORGANIZED BY:**

Electrical Engineering Studies, College of Engineering  
Universiti Teknologi MARA (UiTM) Cawangan Johor  
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## **A-ST077: ENHANCING MARKETING INSIGHT: REAL TIME VISITOR TRACKER**

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### **ABSTRACT**

The abstract highlights the development of an accurate automated visitor counting system to address the inefficiencies and risks of manual counting methods in retail settings. By utilizing advanced components like sensors, high-resolution cameras, and microcontrollers, the system tracks visitor movements in real time, reducing reliance on error-prone manual methods. The primary goals are to enhance safety protocols, improve operational efficiency, and ensure reliable visitor tracking. In addition to daily operations, the system is invaluable during emergencies. In events like fires, terrorist attacks, or missing persons, real-time occupancy data helps identify critical areas, guide evacuations, and assist first responders by pinpointing where help is most needed. This ability enables quick and effective responses while aiding in locating individuals within the premises. Retail managers can use this system to improve emergency preparedness, optimize resource allocation, and refine marketing strategies. The article explains the system's design, including how sensors detect movement, how the Arduino microcontroller processes data, and how the results are displayed on a user-friendly LCD screen. This scalable solution addresses operational and security challenges, supports smarter, data-driven store management, and enhances the overall customer experience in retail environments.

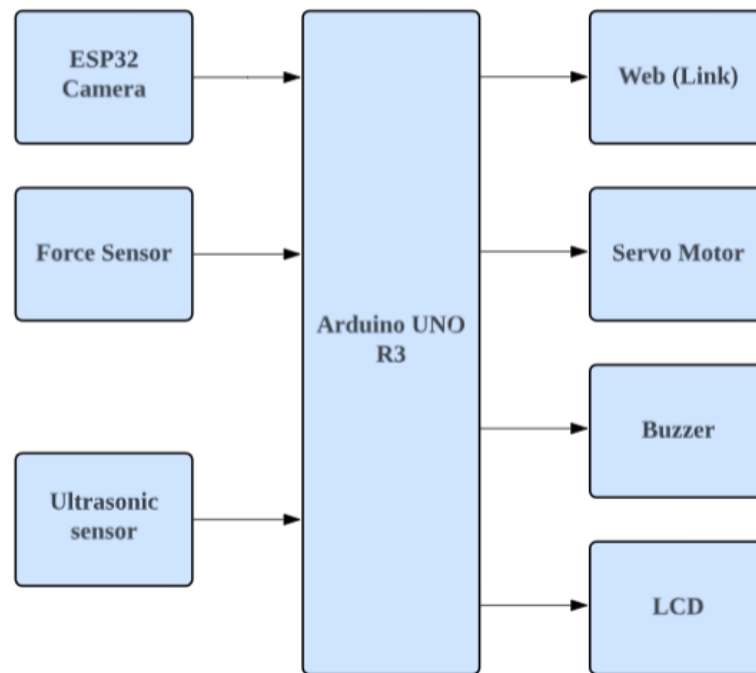
**Keywords:** Real-time tracking, Emergency management, Occupancy data, Marketing strategies

### **1. Product Description**

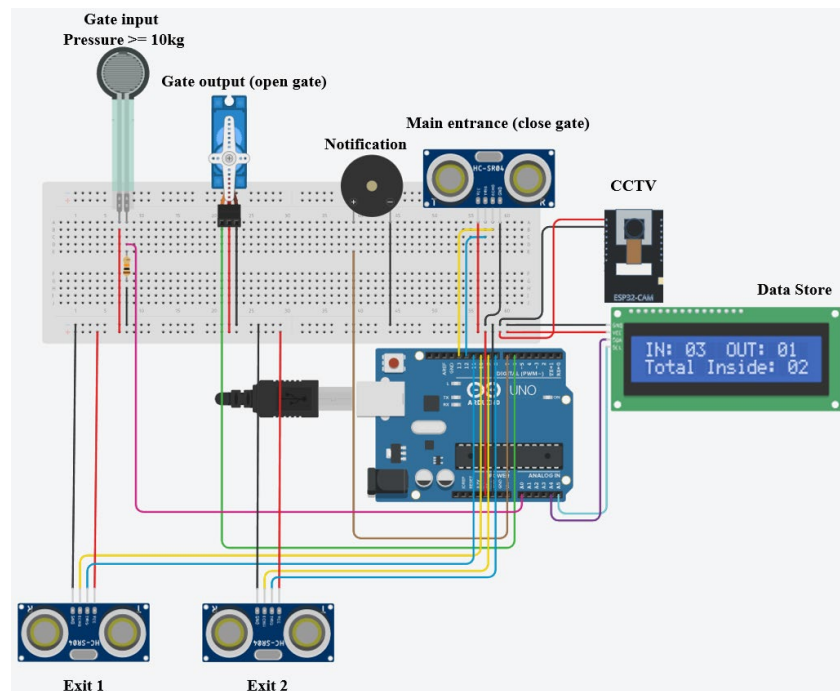
"Enhancing Marketing Insights: Real-Time Visitor Tracker" is a advanced automated system that helps fix the problems and safety issues that come with counting visitors manually in stores. The system uses advanced components like ESP32 cameras, ultrasonic sensors, force sensors, and an Arduino UNO microcontroller to accurately track visitor movements in real-time. This system helps businesses keep track of foot traffic, look at how customers behave, and quickly address safety issues during emergencies like fires or security threats. This design is based on research about automatic visitor counting systems and includes different methods like video analytics, sensor networks, and occupancy estimation. For example, research such as Ashkanani et al. (2015) points out the advantages of using video-based visitor counting to improve operational efficiency, whereas Connell et al. (2013) focus on the possibilities of incorporating video analytics for gaining deeper insights into consumer behavior. In a similar way, Hui et al. (2009) look into how path data can be used to improve marketing strategies, which highlights how crucial it is to track visitors accurately for making strategic decisions. This new system provides a dependable and effective solution for today's

retail settings, bringing together real-time data collection, improved safety, and valuable business insights.

## 2. Pictures



**Figure 1.** Block Diagram of the Enhancing Marketing Insight: Real Time Visitor Counter



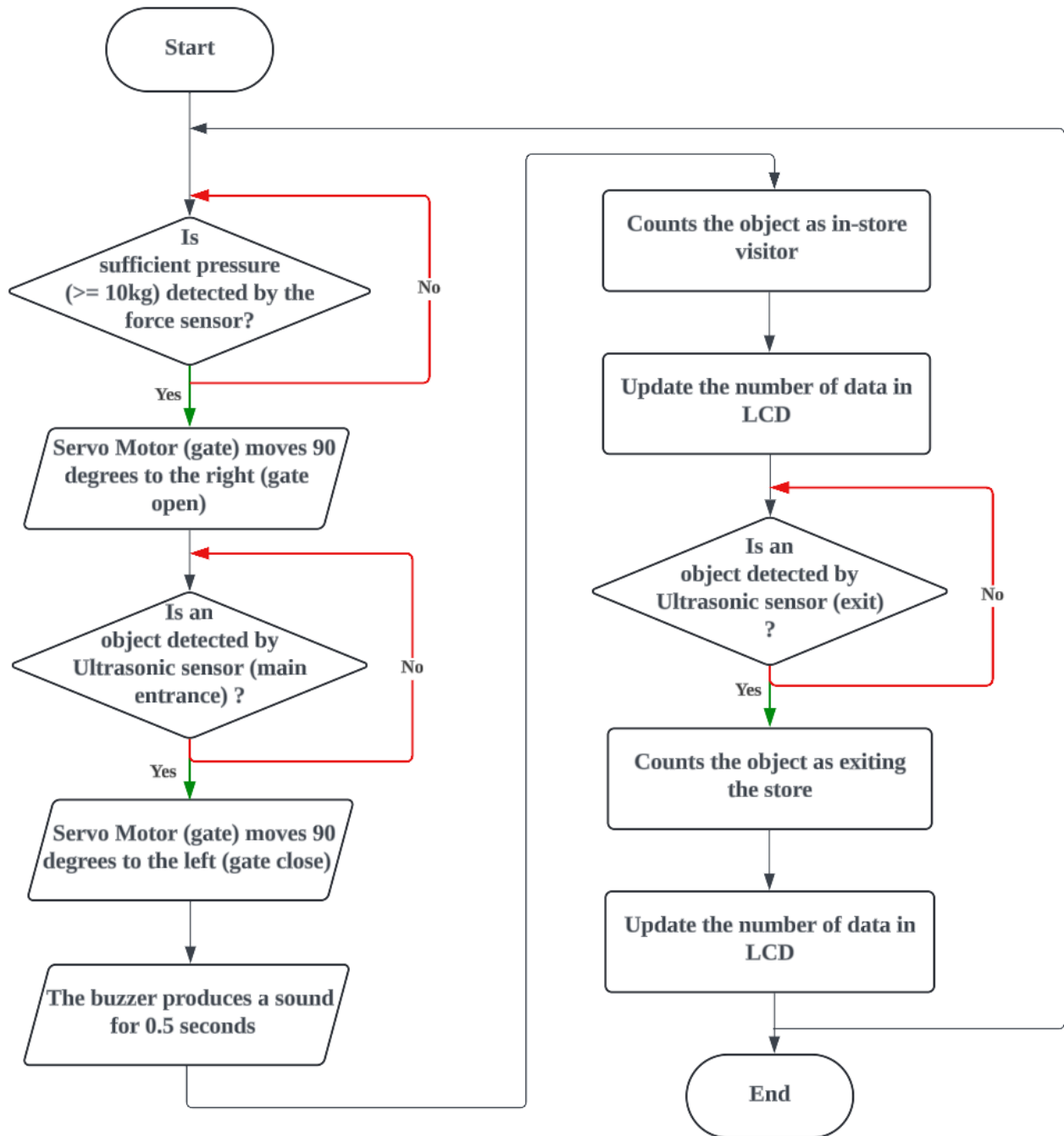
**Figure 2.1 :** Label of Simulation Result



**Figure 2.2:** Result for In-store visitor counting & notification



**Figure 2.3:** Result for ESP32 camera (CCTV)



**Figure 3.** Flow chart of the Enhancing Marketing Insight: Real Time Visitor Counter

**Table 1:** Results of the the Enhancing Marketing Insight: Real Time Visitor Counter

| Force Sensor                    | Servo Motor                        | Ultrasonic 1 (main) | Buzzer                  | Ultrasonic 2 (exit) | Ultrasonic 3 (exit) | LCD                               | ESP32 cam |
|---------------------------------|------------------------------------|---------------------|-------------------------|---------------------|---------------------|-----------------------------------|-----------|
| <b>On (pressure &gt;= 10kg)</b> | <b>On (gate open 90 degrees)</b>   | Off                 | Off                     | Off                 | Off                 | Off                               | <b>On</b> |
| Off                             | <b>On (gate close -90 degress)</b> | <b>On (IN)</b>      | <b>On (0.5 seconds)</b> | Off                 | Off                 | <b>On (IN, OUT, Total Inside)</b> | <b>On</b> |
| Off                             | Off (gate close)                   | Off                 | Off                     | <b>On (OUT)</b>     | Off                 | <b>On (IN, OUT, Total Inside)</b> | <b>On</b> |
| Off                             | Off (gate close)                   | Off                 | Off                     | Off                 | <b>On (OUT)</b>     | <b>On (IN, OUT, Total Inside)</b> | <b>On</b> |

### 3. Novelty and uniqueness

An Arduino microcontroller, ESP32 cameras, force sensors, and ultrasonic sensors are all combined in the new "Enhancing Marketing Insights: Real-Time Visitor Tracker" system to revolutionize visitor tracking in retail environments. It ensures that visitor movements are precisely tracked while simultaneously enhancing safety protocols in the event of emergencies such as fires or security concerns by combining real-time data collecting with automatic gate operations, buzzer notifications, and LCD screens. Through the use of remote monitoring capabilities, the system offers a unique support for marketing strategy optimization, dynamic resource allocation, and smooth security surveillance. Its creative design solves the shortcomings of manual counting techniques and provides precision, versatility, and operating efficiency in contemporary retail environments.

### 4. Benefit to mankind

By resolving the inefficiencies of manual visitor counting, improving operational efficiency, and guaranteeing public space safety, the "Enhancing Marketing Insights:

Real-Time Visitor Tracker" offers substantial advantages to humanity. Through the integration of technology such as Arduino microcontrollers, ESP32 cameras, and ultrasonic sensors, the system provides accurate, real-time tracking, facilitating improved resource allocation and marketing strategy decision-making. Public safety during emergencies like fires or security threats is aided by its capacity to track visitor flow and improve emergency planning, as evidenced by studies on visitor counting systems (Ashkanani et al., 2015). A more sustainable and effective retail environment is also achieved by streamlining staffing and enhancing consumer experiences through the integration of real-time monitoring and data analytics.

## **5. Innovation and Entrepreneurial Impact**

Utilizing cutting-edge sensor technologies like ESP32 cameras, force sensors, and ultrasonic sensors in conjunction with Arduino microcontrollers to precisely automate visitor tracking, the "Enhancing Marketing Insights: Real-Time Visitor Tracker" project exemplifies innovation. This system provides real-time data for better decision-making in marketing campaigns, resource allocation, and emergency planning while addressing the inefficiencies and safety hazards related to human counting. In order to provide a scalable and effective solution for retail and public areas, it has an entrepreneurial influence by changing conventional operating paradigms, improving consumer experiences, and optimizing workforce. The project encourages a culture of entrepreneurship by using technological innovation to solve real-world problems. This encourages the community, academic peers, and business leaders to embrace innovative problem-solving techniques, which in turn advances technology and fosters sustainable economic growth.

## **6. Potential commercialization**

The automated visitor counting system has a great deal of commercialization potential because it can meet a variety of market demands in public areas and retail establishments. The system improves operating efficiency and safety by providing precise, real-time visitor data using integrated technologies including sensors, cameras, and microcontrollers. Businesses can save money by reducing their reliance on manual counting techniques, and the data-driven insights can enhance resource allocation and marketing tactics. Additionally, its usage in visitor safety and emergency readiness enhances its allure in busy settings like malls, museums, and event spaces. The system is a useful tool for companies looking to streamline operations and enhance customer experiences because of its creative use of reasonably priced components, which guarantees scalability and widespread adoption.

## **7. Acknowledgment**

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