Project Report

Rakshak - Smart pressure sensor

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Abstract

In a crowd crush, people are subjected to compressive forces by being pushed from all sides (or against a barrier such as a wall) with nowhere to move into. In a progressive crowd collapse, one person falls, creating a space in the crowd into which others fall, creating an even larger hole. This innovation will try to solve such problems.

Introduction

Crowd management experts say human stampedes often begin when people in front of a group reach a barrier of some form and stop moving or slow down their pace, while those behinds (and who can not see in front) keep moving, assuming those in front will make space.

They could perhaps be more accurately described as a "crowd crush", where most deaths are from compressive asphyxiation rather than trampling.

"The accident, as most know, was a stampede caused by overcrowding and also caused by some of the pilgrims not following the movement instructions of the security and the Hajj ministry," Saudi Arabia's health minister Khalid al-Falih said after the Hajj tragedy.

In the case of the recent Hajj stampede, a type of barrier was formed by a collision between two groups moving towards each other on the same road, according to BBC reports.

Deadly stampedes usually start with a few people killed by the sheer force of the tightly-packed group at the collision point.

Enough force can be produced by a crowd to crush people where they stand.

This can cause rumors to spread around the crowd that people have been crushed, leading to mass panic and people speeding up their walking speed, crowd safety expert Professor G Keith Still told the Washington Post.

"Once that starts, it's already too late to stop the incident escalating," Professor Still said.

Crowds then push horizontally and stack on top of each other vertically in a desperate bid to escape, with many fatally crushed.

Deadly stampedes are not always caused by crowd panic, though — they can also be caused by entrapment in a limited area and physical strain.

As well as at religious pilgrimages, stampedes have caused deaths at sporting matches, music events and during emergency situations, such as fires and explosions.

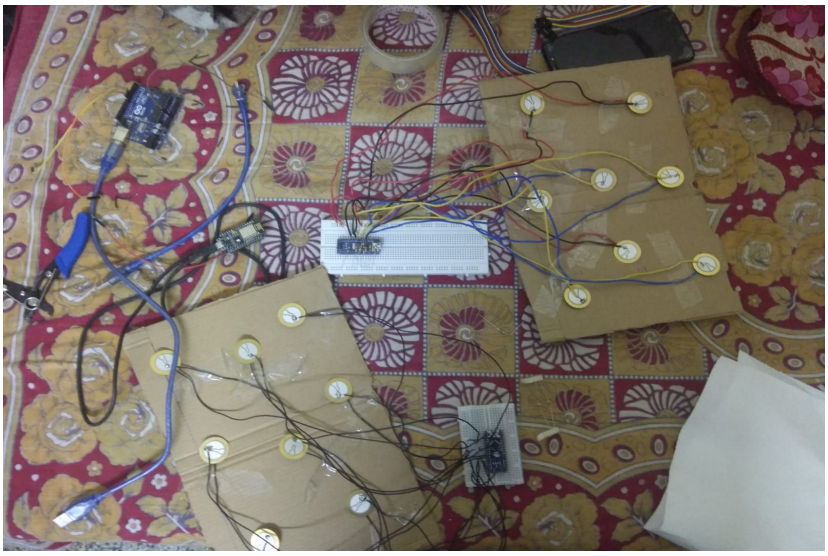
Materials Required :

1. Hardware Requirements :

1. **16 Piezoelectric pressure sensors**
2. **Tape**
3. **Alligator cables**
4. **Jumper wires**
5. **Solder**
6. **Arduino nano X2**
7. **NodeMCU**
8. **16 resistor 1MΩ**
9. **Breadboard X2**

2. Software Requirements :

1. **Arduino software**
2. **Firebase (For Real-time Database)**
3. ReactJs
4. Javascript
5. HTML
6. Cascading style sheet



OBJECTIVE:

A portable mat which has pressure sensors which can count the number of people walking on it, and sends the data over the internet to the database for analysis. The possible errors, like overcounting or double-stepping, will be overcome using design interventions. The optimum size of the mat will be determined.

Inspiration

We considered the wild idea of building a system that would help regulate the flow of people and use it in public places with large gatherings, to have fewer stampedes and, hopefully, fewer deaths.

we wanted to know only three things: the number of people, the location, and the rate of the flow of people per minute. Can we distribute radio-frequency tokens to identify people? We figured out that it would be too expensive and impractical to distribute 30 million tags. Can you use CCTV cameras with image-processing techniques? Again, too expensive for that scale, along with the disadvantages of being non-portable and being completely useless in the case of rain, which is a common thing to happen in some events like Kumbh Mela. Can we use cell phone tower data? It sounds like the perfect solution, but the funny part is, most of the people do not carry cell phones in events with such large gatherings like rallies, Ramanavami, eid, and other large gatherings, etc. Also, the data wouldn't have been granular enough for us. So we wanted something that was real-time, low-cost, sturdy and waterproof, and it was easy to get the data for processing.

Timeline

WEEK 1(15 Aug-22 Aug)

1. Basic research work and project structure are designed.
2. studied about some issues related to them from the papers.

WEEK 2 (23 Aug- 29 Aug)

1. Learned about communication with electronic devices(IoT).
2. Learnt REACT, MONGO DB, NODEJS for making a website.
3. Hardware required for the project is selected were accordingly ordered.

WEEK 3 (29 Aug- 4 Sept)

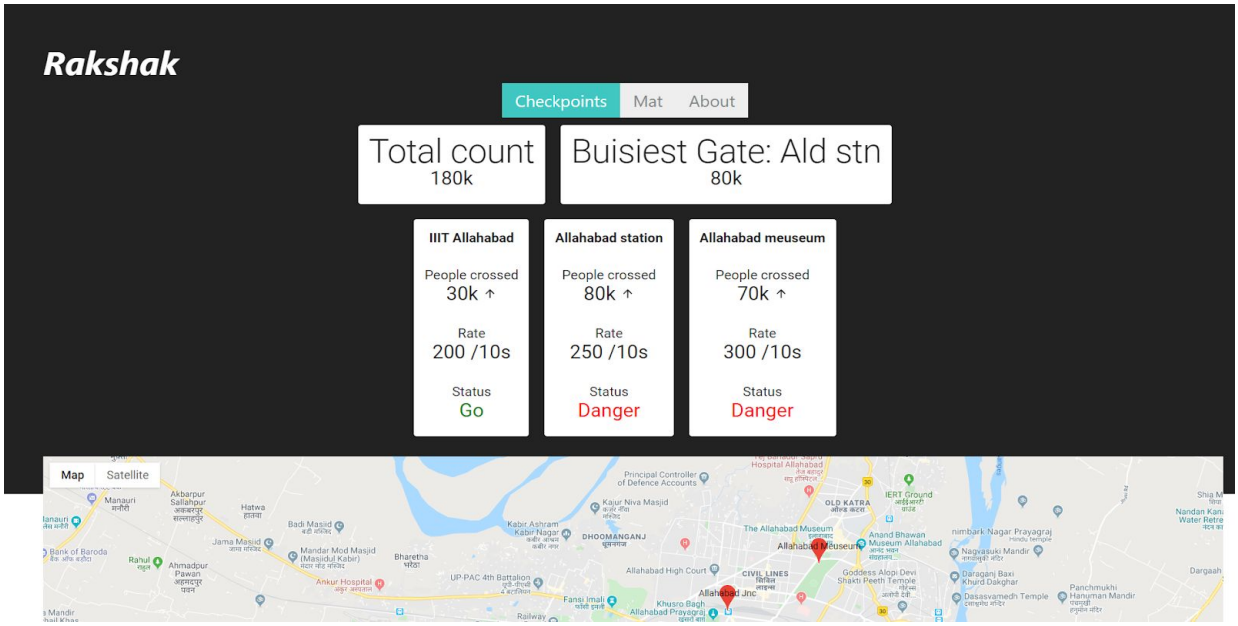
1. The website was designed and was divided into two parts. 1. Client-Side 2. Server Side.
2. Circuits were designed and sensors like Piezoelectric pressure for calculating the number of people, calculating the flow rate.

WEEK 4 (5 Sept- 15 Sept)

1. Working of the Serial module was checked and data was according sent from one Arduino to another by using serial communication.
2. The database for client-side of the website was designed.

WEEK 5 (15 Sept -30 Sept)

1. Made a web app to show the data at various checkpoints, and show map for the following.



WEEK 6-8(1 Oct -15 Oct)

1. Finishing up the web app and building the Mat.

Special Mention -

Mohit Jain
Pranay Chandra

Comments by the Panel :