PIR Motion Sensor
Monitoring the flow of Pedestrians on Bridges

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Overview

• Developing an **economical sensor** which will be responsible for collecting real-time data

• How motion sensors can be used within the **urban environment**

• Pedestrian flow as an analogy to ‘**Thinking Fluids**’
Urban Applications

- Keeping track of pedestrians walking on a certain path – check the **peak and low times of traffic**
- Economical sensor – can be deployed in multiple locations at a very **low cost**
- Bridges have narrow walkways; a **real-time count of pedestrians** can allow a more planned traffic flow
- Predict **pedestrian flow patterns** over a longer period of time
Methodology

• Two PIR sensors placed at a certain angle to each other
• The first sensor detects a person walking from one side and activates the second sensor to ensure the count is not bidirectional
Sensor Implementation

• The **sensitivity** of the sensor is increased so that motion can be detected from more than 10 feet away.

• The PIR sensor is **calibrated** in order to decrease the on time of the output signal so that multiple movements can be detected in a shorter time.
Data Collection and Analysis
Collecting Real World Data

Sensor Implementation on the Brooklyn Bridge

The two picture have been taken at a 1 second interval and the LED is seen to be turned on as a pedestrian walks by, meaning that the count has been made.
Collecting Real World Data

Sensor Implementation on the Manhattan Bridge
Raw Data

- Stored into laptop using Software

<table>
<thead>
<tr>
<th>Timestamps</th>
<th>Output</th>
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</thead>
<tbody>
<tr>
<td>2015-07-22 18:48:48</td>
<td>1</td>
</tr>
<tr>
<td>2015-07-22 18:49:22</td>
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- Manual Count
Brooklyn Bridge
Distribution of People per Minute

- **Manhattan Bridge**
  - Frequency distribution of people per minute.
  - The histogram shows the number of people per minute with a peak around 12 people.

- **Brooklyn Bridge**
  - Frequency distribution of people per minute.
  - The histogram shows a peak around 10 people per minute, with a variation in the number of people per minute.
Improvements

• Use more than two PIR sensors at angles together to increase the accuracy of the motion detected

• Get a steady casing for the sensor that can make it more stable and enhance its efficiency

• Make the circuit more portable by using a SD card and battery

• Collect data in a longer duration
Future Work and Findings

• Expand the deployment of these sensors in public urban areas:
  ◆ Parks Entrance
  ◆ Malls
  ◆ Subway Emergency Exits

Thank you!