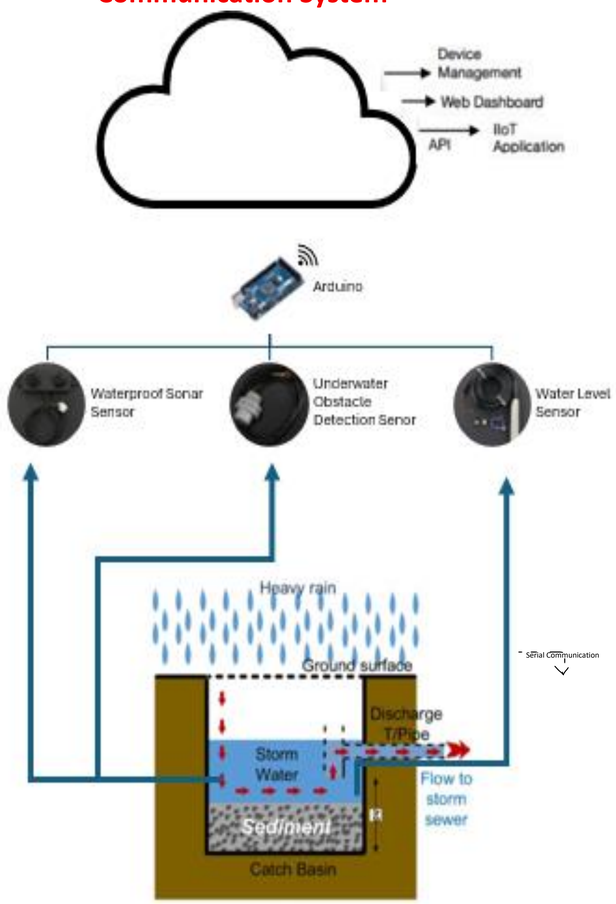
Storm Drain Basin Monitoring System

Introduction

- **Problem:** In Calgary, storm drain blockages cause hazardous conditions and costly traffic disruptions, with recent service requests related to water pooling near storm drains exceeding 1,000 [1].
- **Objective**: Proactively monitor storm drains, leveraging advanced sensors, to enhance infrastructure resilience and minimize public safety risks.
- **Societal Needs**: Addressing this issue directly impacts public safety and economic efficiency, with potential savings in repair costs and traffic delays.
- **Innovation**: Unique real-time detection with advanced sensors for prompt maintenance, precise data, and scalable solutions. Unlike competitors, we provide precise debris level measurements, enhancing data reliability and offering diverse client metrics.
- **Impact**: Our solution promises significant cost reductions, safer roads, and improve infrastructure reliability.

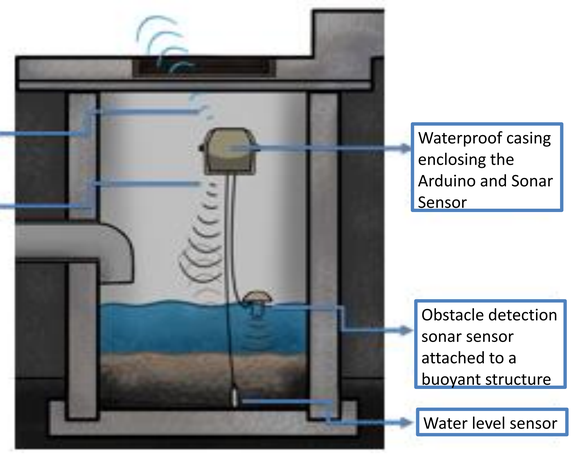
Communication System



Methods and Materials

- **Sonar Sensor:** Positioned at the top of the basin, this sensor accurately measures debris floating on the water surface.
- **Underwater Obstacle Detection Sensor:** Submerged via a buoyant structure, the sonar sensor operates underwater, detecting debris levels within the water.
- **Water Level Sensor:** Submerged at the bottom of the basin, this sensor is critical for measuring water levels within a range of 0 to 5 meters.
- **Outer Case Design:** Utilized a 3D printed water-resistant enclosure for durability and protection against environmental elements.

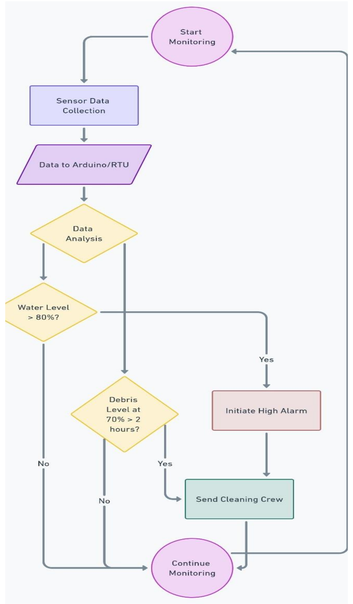
- **Arduino Mega:** Acts as the central controller for sensor interfacing, facilitating seamless communication and swift system response.
- **Boost Converter:** Essential for providing voltage to pressure sensors, ensuring consistent performance in dynamic environments.



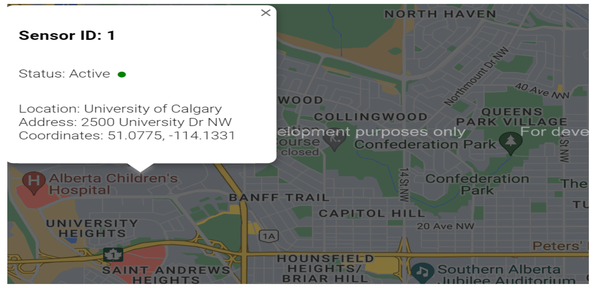
Methods for Future Industrialization

Prototype to Final Product		
Arduino	Translates to	RTU
WIFI Module	Translates to	4G LTE PCI Modem
3D Printed Casing	Translates to	Industrial Grade Custom Casing
Database and Dashboard	Integrates to	Client's System
Independent Battery (5V, 1A)	Replaced to	RTU's integrated battery

Data processing



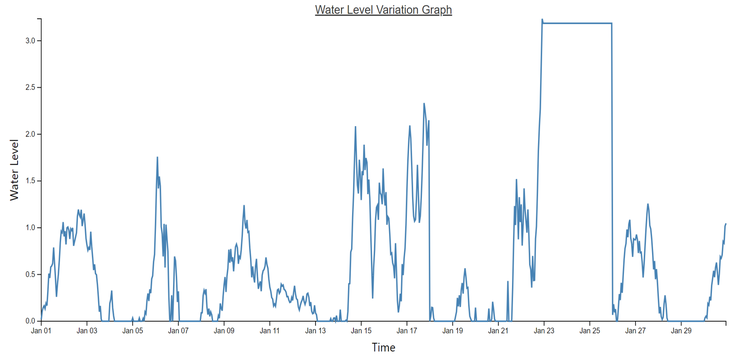
Data Visualization



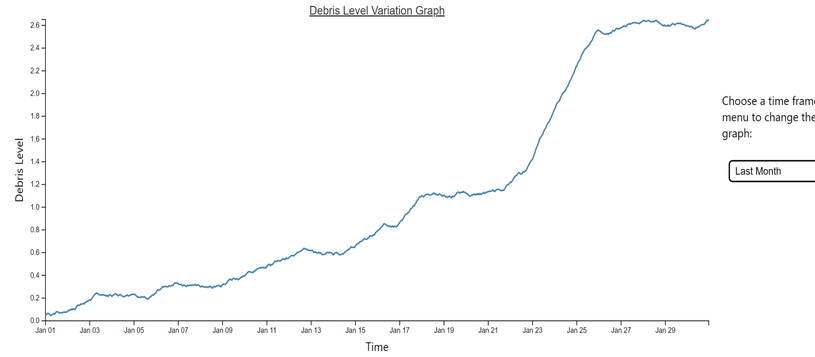
In the **dashboard**, the user will be able to select a basin unit by clicking the marker placed on that map.

Information about the sensor is provided, for example if its active or not.

The Water Level Variation with respect to Time



The Debris Level Variation with respect to Time



Our Dashboard creates sensor-specific graphs showing:
- ✓ Debris accumulation
- ✓ Water level
- ✓ Sensor status (clogged/open)

It Includes a history feature to display:
- ✓ Past water levels
- ✓ Debris graphs for selected dates
- ✓ Sensor data from specific times
- ✓ Graphs will reflect data from the sensor chosen on the map.

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References:
[1] C. News, "Water pools near storm drains causing issues across Calgary," The Weather Network, https://www.theweathernetwork.com/en/news/weather/severe/city-tackles-more-than-1-000-service-requests-as-water-pools-near-storm-drains