A Data Analysis of Champaign's Infrastructure

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INTRODUCTION

How do we turn Champaign into a smart city?

One of the most crucial resources available to Champaign is a gigabit fiber optic network, giving us the potential to become one of the country's most developed smart cities. **Our current goal is to develop a fully-fleshed, autonomous application where public officials can view real-time data gathered via sensors and predict pinpointed locations of potential concern on a map.**

AT HACKILLINOIS

- Ran nine years worth of data (provided by the City of Champaign) through software
- Identified common locations in a 1.5 km radius that reported issues of flooding or sewage
- Two major locations of damage included the **Northwest side of UIUC campus** and **West of Champaign Country Club**

On July 12th, 2014, Champaign received 2.77 inches of rain (according to Wunderground) and **136 separate reports of flooding and issues with drainage.**

This is an example of an instance where the sewers cause the city to flood, therefore indicating that it would be necessary to try to monitor and fix this issue.

We consequently planned a design for a **Wireless Underground Sensor Network (WUSNs)** that involved developing low cost, high efficiency sensors, and installing them throughout the town. These sensors would then monitor factors that contribute to sewage spills and flooding, and would be able to notify city officials and potentially reroute flood water to dry areas.

SHORT TERM GOALS

Currently, our team is developing **an autonomous system that monitors and detects weaknesses in the town of Champaign's infrastructure**. Our focus is on sustainable solutions that can help detect flooding and other potential hazards to public health, and use sensor and public city data to create a visualization of infrastructure and health issues in the town for residents and city officials to observe. Not only do we intend for our system to be used to save thousands of dollars in damage repairs, but also to build empathy within our community and allow residents to help one another.

Our focus is on four key factors:

Find correlations and patterns in data from multiple data sources, specifically **ticketing** and **sensor data**

Create a **visualization** of Champaign with potential **areas of concern**

Build and **train** models that predict flaws in infrastructure based on past failures

Monitor patterns and alert city officials **real-time**

Data from 07/12/14

Public Champaign Flood Map

RESOURCES

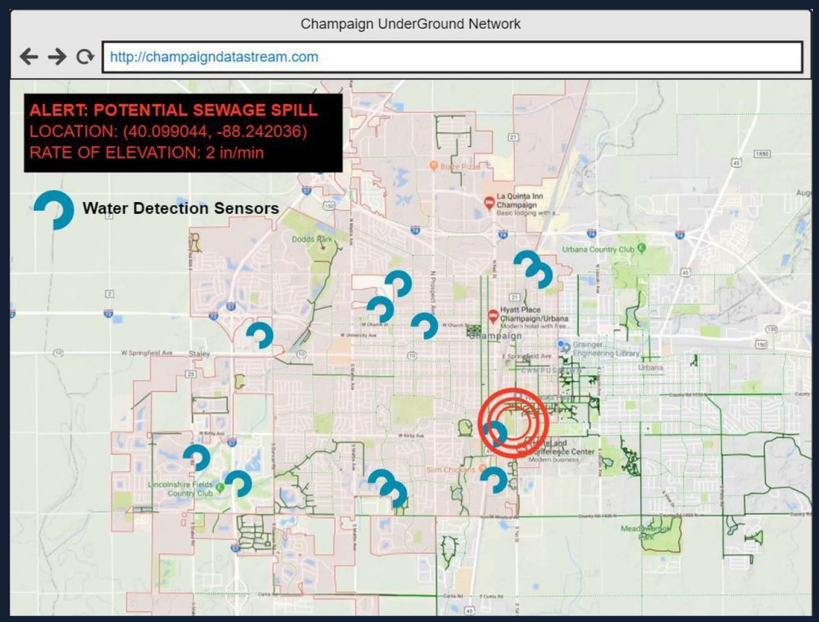
Resources pivotal to our project that we'll be using in the near future include:

- Ticketing data
- Sensor data
- US Ignite Smart Gigabit Community
- Past infrastructure development plans

Sources of inspiration for our project include:

- CSONet | South Bend, Indiana
- Kansas City Smart Sewer System | Kansas City, Missouri
- MSD Smart Sewer System | The Metropolitan Sewer District of Greater Cincinnati
- Underworlds | MIT
- Smart City Platform | Jakarta Provincial Government

Depending on the type of data we can gather, our project has the potential to change direction and focus more on building tools that help build empathy between residents in Champaign's community, or solve public health concerns caused by changing weather and standstill water in Champaign.



Potential design of a web application interface that city officials and residents can access to be alerted about potential hazards in the town.

A SUSTAINABLE FUTURE

Short Term Advantages

- A low cost replacement for unnecessary and arduous construction costs
- City officials can respond to crises immediately and avoid severe damage to infrastructure, protecting residents and their homes and businesses.
- Be able to continuously adapt how the town reacts to emergencies, in addition to changes in the environment such as climate change.

Long Term Advantages

- Adapt to changing weather patterns
- Expand to different applications
- Build a stronger foundation for future applications of technology
- Turn Champaign into a forefront in smart cities

Taking this first step will not only make Champaign a forefront in technology in the United States (and potentially the world), but also improve economies, career opportunities, and lifestyle for residents in Champaign and surrounding areas.

NEXT STEPS

In the following months, we will be building sensors that can collect data on water flow and volume of water in the water stream systems of Champaign.

- Gather public health data, such as chemicals in our clean water, via sensors
- Install rain gardens
- Build sensors that gather flow rate and volume of water information from water sources

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