3D Weather Visualisation

Virginia Tech
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Client: Zachary Duer
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Blacksburg, VA, 24061

Trevor White
4/28/2016
Overview

• Worked with Zachary Duer and Trevor White
• Portions of a larger project
• The Cube
• 3D Doppler radar data
• Unity and C#
Structural Overview

Backend System
- Statement Parsing
- Controller

Client-Created Systems
- 2D Doppler Renderer
- 3D Doppler Renderer
- Doppler Radar Data

Frontend System
- User Interface
Frontend:

- From the front end the user chooses where to be positioned in 3D Space using a tablet
  - Done through Unity built interface
- Simple UI for simple movement
- Big buttons because the screen is hard to see with goggles
- 4 buttons to move in 4 directions
  - 1 button to bring the user back to the center
Frontend: UI Representation

- Move Forward
- Back to Center
- Move Right
- Move Backward
- Move Left
Frontend: Logic

• Unity Editor provides API
• Each button had a corresponding C# script that moves the user.
  • The code for each button only differs between directions to move
• Update gets called after every move by the user
  • The user’s position is then updated to the current position and then writes out the position in a formatted data file
  • The file will then be used by the client’s software so that VR and/or AR goggles can update the user’s POV in the 3D scene
Frontend: Logic Flow

Button Press → Button → Update File → Read File → Client Side Software
Clients’ Work

• Trevor White takes the warning information
  • Renders onto 2D doppler data
  • Allows users to interact with warnings
    • Displays related severe weather statements
  • Allows user to step back to previous timeframe

• Zachary Duer takes input from Trevor’s program
  • Renders 3D doppler data in Unity
  • Uses augmented reality/virtual reality headset
Polling

The main website: http://warnings.cod.edu/

Web Crawler ➔ Polling Class ➔ Reverse Class ➔ Controller ➔ Parsing

Downloads Files ➔ Storage ➔ ...
Parsing

- Files from College of DuPage broken into statements
  - They sort by publication time
  - We sort by relevant warning
- Statements parsed for
  - Publication Time
  - Warning ID
  - Warning Duration
  - etc
- Warning objects created/updated/stored
- Active warnings tracked
BULLETIN - EAS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE NORMAN OK
240 PM CDT MON MAY 20 2013

THE NATIONAL WEATHER SERVICE IN NORMAN HAS ISSUED A

* TORNADO WARNING FOR...
  NORTHWESTERN MCCLAIN COUNTY IN CENTRAL OKLAHOMA...
  SOUTHERN OKLAHOMA COUNTY IN CENTRAL OKLAHOMA...
  NORTHEASTERN GRADY COUNTY IN CENTRAL OKLAHOMA...
  NORTHERN CLEVELAND COUNTY IN CENTRAL OKLAHOMA...

* UNTIL 315 PM CDT

* AT 238 PM CDT...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED A
  SEVERE THUNDERSTORM CAPABLE OF PRODUCING A TORNADO. THIS
  DANGEROUS STORM WAS LOCATED NEAR NEWCASTLE...AND MOVING EAST AT 20 MPH.

IN ADDITION TO A TORNADO...LARGE DAMAGING HAIL UP TO GOLF BALL SIZE
IS EXPECTED WITH THIS STORM.

* LOCATIONS IMPACTED INCLUDE...
  NORMAN...MOORE...NEWCASTLE...BRIDGE CREEK AND VALLEY BROOK.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

TAKE COVER NOW IN A STORM SHELTER OR AN INTERIOR ROOM OF A STURDY
BUILDING. STAY AWAY FROM DOORS AND WINDOWS.

$$
LAT...LON 3522 9740 3519 9771 3530 9775 3543 9744
TIME...MOT...LOC 1940Z 24BDEG 19KT 3526 9766

$$
THE NATIONAL WEATHER SERVICE IN NORMAN HAS ISSUED A

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Writing to File

- Statement text stored in file
  - Stores statements without warnings
  - Accessible at later time
- Stored in format “YEAR\SSSS#####MMDD”
  - YEAR - Four-digit year of publication
  - SSSS - Station issuing the warning
  - ##### - Event Tracking Number (ETN)
  - MM - Month of warning start
  - DD - Day of warning start
- Log of warning start/end times
- Unlinked statements separated
  - “YEAR\SSSSMMDD”
    - Year, Station, Month, Day
Acknowledgements

• Zachary Duer for allowing us to work on the frontend
• Trevor White for teaching us about severe weather statements, and allowing us to work on the backend
• College of DuPage for their server and collection of severe weather statements