Cartographic Potential of New Technologies: Applying Innovative Technologies

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City of Norfolk

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Applying Innovative Technologies

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Outline

• Using LiDAR data to monitor Ocean View Beach
  • Sand & beach management plan
  • Post-storm assessments

• Flood monitoring sensors
  • Regional
  • Local

• Ongoing and future efforts
Norfolk Partnership LiDAR Project

- Funded by multiple Federal, State, and Local agencies
- Collected in April 2013 by Dewberry
- 2.5-ft cell size Digital Elevation Model (DEM)
- ASPRS Classified Point Cloud Data - *.las files
- Processing input files
  - Inland Ponds & Lakes
  - Inland Streams & Rivers
  - Tidal Waters
- Includes several feature extraction datasets
  - Vegetation
  - Tree Points
  - Buildings – 2D & 3D
Applications of LiDAR

• Flood Modeling and Sea Level Rise
  • HRPDC SLR Reports
  • Tidal Inundation Tracking Application for Norfolk (TITAN)
  • StormSense
• Sand, Beach, Dune Analysis – 3D profiles
• Bathtub overflow and volume calculations – BMPs, basin rim elevations, storm water infrastructure
• Design & Construction of Public Works projects
• Rapid Assessment of tree debris following storm events:
  • Ice storm
  • Hurricanes & Nor’easters
An Urban Beach Community

- Approximately 7.5 miles of beach
- The dune and beach are a dynamic environment
- Long history of development
Joaqu'easter

NOAA NOS CO-OPS
Observed Water Levels at 8638510, Sewells Point VA
From 2015/10/01 00:00 LST/LDT to 2015/10/07 23:59 LST/LDT

Height in feet (NAVD)

Ocean View Beach 10/2/15
Data Acquisition

- Public Works Disaster Planning Meeting on 9/30/2015
  - flyover on 10/8 at low tide
- GIS Data Deliverables
  - LiDAR
    - 1ft DEM
  - Orthophotography
    - < 2in pixel resolution
  - Oblique imagery
- Horizontal coordinate system and vertical datum
**Historical Data**

- **2015 Fall CBH and M&N Survey**
- **2014 NOAA NGS Post Sandy Topobathy Lidar**

**Lidar Acquisition**

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**Map showing trend of Lidar acquisitions and changes over the years from 2009 to 2016.**

- **2013 USGS Lidar: Norfolk (VA) – 2.5ft DEM**
- **2009 City Lidar – 5-ft DEM**
3D Scenes
3D Modeling
Existing Applications

TITAN – Tidal Inundation Tracking Application for Norfolk
  •  http://gisapp1.norfolk.gov/TITAN

STORM – System to Track, Organize, Report, and Map
  •  STORM Mobile – crowd sourcing, light version of storm for public use – http://gisapp1.norfolk.gov/stormmobile
  •  STORM Map – Searchable online mapping application – http://gisapp1.norfolk.gov/stormmap
Grow What We Have

Expanding the Network of Sensors
How To Do It?

• Utilize LoRaWAN (“Long Range”) wireless technology for data transmission
  • Ideal for IoT systems.
  • Low power
  • Low data rate
  • Long range
  • No licensing fees for use

• LoRaWAN Gateway acts as the uplink for sensor data.
  • The “bridge” between sensors and the internet.
  • Typical range 2 km (1.2 miles) with quarter length antenna.
  • Longer range with large antenna.
Why?

- Early warning for residents:
  - Text message, notification, email, Facebook, Google+, Twitter, etc...
- Updates to social mapping/traffic applications (Waze)
- Targeted notifications
- Early warning to emergency services (EOC, fire, rescue, traffic center)
- Redirect to avoid flooding
- Data can support calibration of water level models.
- Foundation for a predictive model.
Regional Project in the Works – StormSense
Forecasting Flooding from Storm Surge, Rain, and Tides

- Benefits to the Cities and Our Residents
- Emergency Operations Centers across the region will now be able to view the same information in a single Common Operational Picture
- Promotes Regionalism and better sharing of information and resources
- IoT sensor data is ported through industry standard formats and software so Cities in the region can develop custom web applications tailored to their individual needs as well
Regional Project in the Works – StormSense
Forecasting Flooding from Storm Surge, Rain, and Tides

• Begin with smaller contingent of coastal local governments with high-population density first
• Current Hampton Roads Partners
  • Local Governments:
  • Academic and Organizational Partners
• Replicability, Scalability, and Sustainability
  • GCTC Action Cluster
  • NIST Replicable Smart City Grant $75,000 (9 sensors+)
• Expand the program to neighboring jurisdictions,
• Then regionally via a Long-Term Predictive Modeling Plan for local, regional, national, and global applications
Ongoing & New Efforts with our Partners

- Retain Your Rain
  - Parcel level BMPs
  - Green/Blue Infrastructure
  - Educating our Residents
- Hampton University & ODU Partnerships
- Challenge Prize Contests
  - GOV2COM – SLR Market Bridge Challenge
  - Regional Broadband Challenge
  - Porous City – A&E Design Challenge
- Coastal Resilience Laboratory/Accelerator
  - Broker between companies, innovators, and investors
Thank You!

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