CyberEye: A Cyber-Collaboratory for Risk Modeling & Assessment to Mitigate the Impacts of Hurricanes in a Changing Climate

GRAND CHALLENGE: Recent losses have made it very clear that the models used in risk assessment and loss estimation need adjustments not only to capture changes in hurricane frequency and intensity, but also to include secondary hazards like the impact of waves, storm surge and inland flooding. Through research advances seeking to address these deficiencies, our knowledge of hurricane hazards and their impacts is rapidly evolving but is often not effectively harnessed in a manner that leverages the vast intellectual and computational resources being developed across the country.

OBJECTIVES
The CYBER-EYE Initiative responds to this challenge by:

- Establishing a scalable, user-friendly cyber-infrastructure that synergizes existing models, simulation tools and risk assessment frameworks to assess the impacts of hurricanes on society
- Gaining participation from leading institutions to build a cyber-collaboratory around this infrastructure, allowing the pooling of resources and exchange of knowledge within the Virtual Coast Portal
- Engaging end-user communities through the Virtual Coast Portal to better inform decision making and planning efforts
- Creating new venues for education within the Virtual University Portal to train the next generation of professionals across the spectrum of K to Grey Learners

CAPABILITIES

- Secure web platform supporting powerful visualization and rapid, high fidelity assessments of:
  - Hurricane surge, inundation and wind fields
  - Impacts to coastal infrastructure and communities
  - Risk and loss estimates
- Secure and centralized data depot with powerful data exploration and visualization tools
- Secure interactive virtual collaboration space
- Complete decision support system for non-expert end users
- Fully extendable to wide classes of hazards

DEVELOPMENT CYCLE

0. Founded upon initial prototype called Hakou, which was developed as a standalone executable for rapid hurricane risk assessment for the Hawaiian Islands

I. Hakou operationalized into secure web-accessible and cloud-supported application with integrated GIS and customizable user interfaces

II. Supporting tools (widgets), expanded database added

III. Integration of streaming data, expansion of modules

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**PLATFORM DESCRIPTION**

The CyberEye environment represents an adaptable framework within which developers can rapidly create collaborative web applications that encapsulate and interface to computational models as well as facilitate heterogeneous, geospatial data exploration. CyberEye adopts a client-server model, where views of the data (applications) are separated from the details of the data storage and organization, employing the web standard Representational State Transfer (REST) as an implementation medium for this Service Oriented Architecture (SOA). The RESTful API supports the modular development of tools to allow CyberEye to readily accept and integrate data and contributions from community members.

Open-source, modular components of the Django-based GeoAnalytics framework provide the foundation for the CyberEye environment. CyberEye extends the geospatial collaborative tools developed as part of Geoanalytics, using them as “components” inside of each user’s personal data exploration dashboard. Registered users can select what modules (termed widgets) will be displayed in their personal dashboards and can control their sizing, placement and arrangement within the web browser. This modular approach to development then allows the menu of tools (modules called widgets) to expand with time. The dashboard also is the basis of a collaborative toolset that allows users to explore, share and annotate map data as well as data provided by the modules, all from within this dashboard environment. Membership permissions allow users to regulate access to only those with whom they wish to collaborate and exchange views from their personal dashboards. Our use of open-source GIS eliminates the challenge presented by traditional tools such as HAZUS that rely on closed-source GIS to again encourage community contribution and transparency.