ENERGY-NEUTRAL DISTRIBUTED VISUAL SENSOR NETWORKS FOR INFRASTRUCTURE MONITORING (ENDVISENIM)

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INTRODUCTION.

Energy-neutral Visual Monitoring: Infrastructure projects such as Oil and gas pipelines or wind and underwater turbines, high-speed railways, large airports, automated patient monitoring in hospitals, traffic and crowd flow monitoring, livestock monitoring, automated industrial robotics for manufacturing, raise a very strong demand for distributed data gathering systems for monitoring and analysis purposes. One of the most desired modalities for such data gathering systems is visual information, in the form of pixel arrays representing visible, infrared and depth-map information, or via the extraction of points of saliency in such data (e.g. edge & corner points in images or irregularities of motion vector fields in video) . This is because such visual information can be used for constant monitoring from a remote location, or indeed by automated computer vision and image analysis algorithms that detect trends, threats to the infrastructure, anomalous behavior, unauthorized access, etc.

METHODOLOGY.

The main objectives are: (1) Analytical modeling of conditions for energy neutrality in function of the VSN/LPBR settings. (2) New communication protocols for visual sensor networks and new resource discovery, and adaptive data transmission for visual information over wireless broadband networks such as LTE. (3) The provisioning of a multimodal three-layer sensor activation process for the VSN that provides for increased visual coverage under increased energy consumption (Fig. 1).

CONCLUSIONS.

Socio-Economic Impact: This research project investigates how to achieve energy neutral operation of visual sensor networks equipped with energy harvesting (EH) capability, by developing a novel and fundamental energy management framework based on the three objectives. The research works have impact on sectors directly associated with the research project as well as indirect impact on various other sectors. The direct Impacts are networking technology for VSNs and the Smart Infrastructure and Construction Industry, while the Indirect Impacts are the digital economy industry and Future Cities.

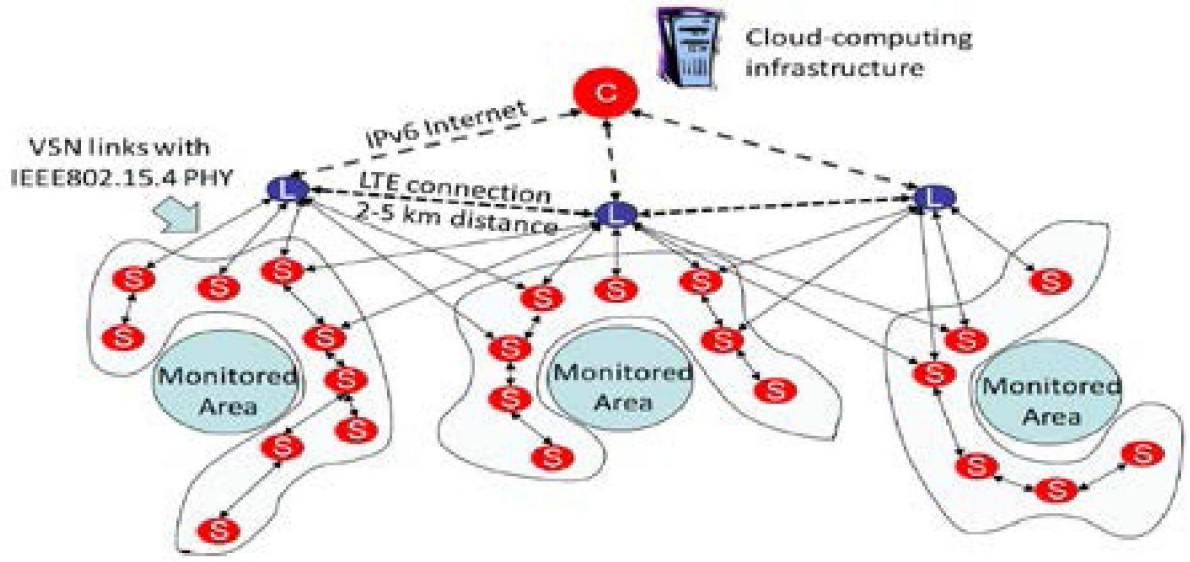

Figure 1. *Nodes within the SAP capture a certain layer of visual information data with specified settings for spatio-temporal-quality resolutions and multimedia processing levels (from salient point extraction to motion-compensated video encoding). Some sensor nodes may be connected to more than one LPBR if their location is close enough to allow this to occur. This will ensure mitigation of LPBR failures or outages.*

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