

Research Project List

Title	Description
Motor Control Labs for characterization and analysis	Test the performance over different electrical motor technologies. Torque, speed, vibrations, electromagnetic emissions, thermal phenomena
Electromagnetic Simulation for Novel Inductive Machines	<p>Perform a 3D Electromagnetic fields simulation for different kind of novel inductive and electromagnetic machines:</p> <ul style="list-style-type: none"> *Electromagnetic Breaks *Kinetic Energy Recovery Systems (KERS) *Magnetically Coolers *Electromagnetically Bearings *Hubless Wheel e-Motor *Ionic Propulsors *Power Transmission via Plasma arcs *Novel Configuration for Exotic Coils and Exotic Induction Patterns *Hypersonic Electromagnetic Railgun *Homopolar Generators and Energy Harvesters *Energy Storage Systems as: Super capacitors, Fuel Cells, Batteries *Novel Electromagnetic Liquid Materials
Electrification of Everything and Power Conversion	Conversion of electric energy from one form to another such as DC-DC, AC-DC, DC-AC, AC-AC in applications to make anything electrical powered

Safety / Security	<p>Electronic Safety and Security products focus primarily on the electronic aspect of safety and security systems.</p> <p>Examples of electronic safety and security products can include:</p> <ul style="list-style-type: none"> * Intrusion detection: Electronic burglar alarm and perimeter protection hardware, software and equipment. * Electronic access control: Controls and monitors facility access by electronic means. Examples include electronic operators that open and close security gates. * Electronic surveillance: Includes closed circuit video surveillance equipment, as well as electronic personal protection systems that announce the need for assistance. * Electronic detection and alarm: Controls, graphical user interfaces (GUIs), alarms, logic systems and sensors designed to alert and/or notify inhabitants, firefighting professionals or security authorities when fire, smoke, carbon monoxide, radiation, fuel gas, fuel oil or a refrigerant is detected.
Medical Apps	Open to any idea in the medical, health or mindfulness fields. Main focused in non-invasive novel techniques supported with electronic and electromagnetic devices.
Multicore Management	<p>Enabling software management for multicore caches with a lightweight hardware support.</p> <p>The management of shared caches in multicore processors is a critical and challenging task. Many hardware and OS-based methods have been proposed. However, they may be hardly adopted in practice due to their non-trivial overheads, high complexities, and/or limited abilities to handle increasingly complicated scenarios of cache contention caused by many-cores. In order to turn cache partitioning methods into reality in the management of multicore processors, it is needed a propose to provide an affordable and lightweight hardware support to coordinate with OS-based cache management policies. The proposed methods should be scalable to many-cores, and perform comparably with other proposed hardware solutions, but having much lower overheads, pretending that could be easily to be adopted in commodity processors.</p>
Drones/Rovers	<p>Fight Fire with Flyers and rollers</p> <p>Fires cause billions in damage, destroy entire towns and forests and put countless lives in danger, including first responders at the front line.</p> <p>Join the first Hover Games Challenge and build a robotic drone/rover system to help firefighters in their mission of saving and protecting lives.</p> <p>[https://www.hovergames.com/]</p>
Interior / Exterior Lighting	Hi Efficiency and Smart Lighting

Audio	<p>Hi Performance audio systems for: HIFI audio, 3D audio and Holophonics, Photoacoustic Laser systems.</p> <p>Holophonics is a binaural recording system that is based on the claim that the human auditory system acts as an interferometer. It relies on phase variance, just like stereophonic sound. The sound characteristics of holophonics are most clearly heard through headphones, though they can be effectively demonstrated with two-channel stereo speakers, provided that they are phase-coherent. The word "holophonics" is related to "acoustic hologram".</p>
AI / ML for small embedded systems	<p>Pre-trained neural networks, machine learning cells to perform an Interoperable smart grid in a commodity cluster computing, mote's enablement</p>
Middleware	<p>Middleware is computer software that provides services to software applications beyond those available from the operating system. It can be described as "software glue". Middleware makes it easier for software developers to implement communication and input/output, so they can focus on the specific purpose of their application.</p>
OTA	<p>Over-the-Air programming (OTA) refers to various methods of distributing new software, configuration settings, and even updating encryption keys to devices like cellphones, set-top boxes or secure voice communication equipment (encrypted 2-way radios). One important feature of OTA is that one central location can send an update to all the users, who are unable to refuse, defeat, or alter that update, and that the update applies immediately to everyone on the channel. More recently, with the new concepts of Wireless Sensor Networks and the Internet of Things, where the networks consist of hundreds or thousands of nodes, OTA is taken to a new direction: for the first time OTA is applied using unlicensed frequency bands (868 MHz, 900 MHz, 2400 MHz) and with low consumption and low data rate transmission using protocols such as 802.15.4, Bluetooth and ZigBee.</p> <p>One application is the enablement of a sensor node, also known as a mote, it is a node in a sensor network that is capable of performing some processing, gathering sensory information and communicating with other connected nodes in the network.</p>

Ethernet AVB

Audio Video Bridging over Ethernet (AVB) is a set of IEEE standards for transporting audio and other real-time content over Ethernet.

From a high-level perspective, AVB works by reserving a fraction of the available Ethernet bandwidth for AVB traffic. AVB packets are sent regularly in the allocated slots. As the bandwidth is reserved, there will be no collisions.

AVB often is purported to only serve large-scale applications, such as music venues. However, it also is excellently suited to small-scale applications such as consumer audio, audio conferencing, and in-car entertainment. Daisy-chained AVB fits these applications because it avoids the need for switches without reducing the system's capacity.

Automotive tailored requirements:

Automotive use cases typically fix many parameters at the system definition phase, which means that AVB implementation can be optimized and simplified to some extent.

- * Best Master Clock algorithm (BMCA): the best clock master is fixed at the network definition phase so dynamic selection using BCMA isn't needed.

- * SRP: all streams, their contents and their characteristics are known at system definition and no new streams are dynamically created or destroyed; the proper reservation of data is known at the system definition phase; switches, talkers and listeners can have their configurations loaded at system startup from pre-configured tables, rather than from dynamic negotiations

- * Latency; while this is not critical, delivery is. Automotive networks are very small with only a few nodes between a talker and listener. It is more important not to drop packets due to congestion.