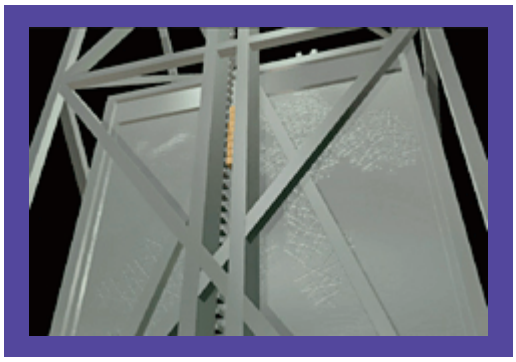

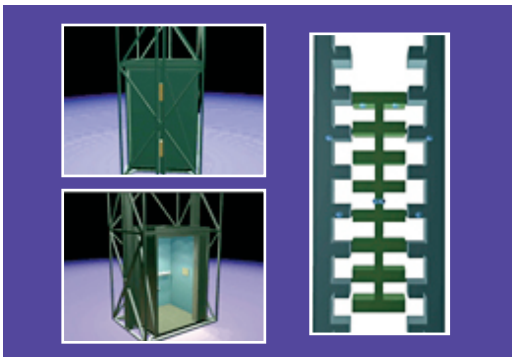

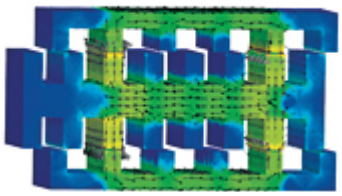

A team of undergraduates is working with ECE researchers to apply a ground-based linear propulsion technology to home elevators. The switched reluctance linear motor system would require just two tracks and a linear motor, eliminating the need for cables, gears, and counter weights. Current would only be excited along the path where the elevator is at any moment. Directly above is a diagram of the flux characteristics.

Designing a $1000 switched-reluctance home elevator

A research team that includes more than 15 undergraduate students is applying Virginia Tech's PERTS linear propulsion technology to vertical travel – in home elevators, shipboard elevators, and high-rise elevators.

The electric propulsion system using a switched reluctance linear actuator was first developed for a prototype maglev personal transport system.

The application to elevators is very promising because of the space savings that a switched reluctance system could provide, according to Krishnan Ramu, director of the Motion Control Systems Research Group. Linear propulsion elevators would require a small track on two sides and a linear motor, eliminating space-consuming cables, counter weights, and gears.

Space saving elevators would be of particular benefit for homes, ships, and high-rise buildings, where space becomes a greater premium on higher floors.

"This technology has great potential in the housing market as the baby boomers age and want to adapt their houses," said Ramu. "Most houses were not built to accommodate the space a conventional elevator would take. With our technology, the required space would be little more than the elevator box itself."

His team is currently designing a prototype home elevator system that would cost just $1,000, compared to current home elevator prices of $15,000-$25,000. "The undergraduates in the Virtual Corporation started the project," Ramu said, "and they are now working with graduate students to build the prototype. They are comfortable with the technology because they have access to earlier switched reluctance prototypes and databases," he said. "If they don't understand how it would work, they just go over and look at the functional prototypes."

The team faces technical challenges in adapting the horizontal propulsion to a vertical system, including safety, assembly constraints, and control. "The control issues are critical," Ramu said, explaining that smooth operation of the elevator and door are more noticeable in elevators than heavy transit systems.

Safety is also a concern. "Backup operation in case of power failure is a much bigger issue than with the transit system. With the transit system, the vehicles are only a half inch off the ground, but in an elevator, the drop can be dangerous," Ramu said. "No mishap is acceptable." Other challenges involve construction and assembly in a tight space.

The team is also exploring elevator technology for the all-electric ship, where a heavier load would be lifted under more rigorous use.

& Laboratories

Digital Signal Processing Research Laboratory (DSPRL)
http://www.ee.vt.edu/~dsprl/
DSPRL is investigating, with SPAWAR Systems Center, non-Wiener effects occurring in adaptive filtering involving narrowband signals. Extensions to array signal processing are under way. Other efforts include direction of arrival estimation, speech coding, accelerating convergence of adaptive algorithms, and EEG modeling. Director: Louis Beex

Intelligent Control Group
www.vtti.vt.edu/flashlab
Current research is related to the small scale intelligent vehicle project, which involves developing a scale model platform for the rapid prototyping and testing of ITS systems and technologies. Other goals include developing future technologies that will help the public adapt to rapid changes in the automotive industry, such as autonomous vehicles. Director: Pushkin Kachroo

Virginia Active Combustion Control Group (VACCG)
http://www.combustion.me.vt.edu/
This interdisciplinary group studies the interaction of combustion and acoustics often found in power generation turbines and aircraft engines. Primary goals of active combustion control are to reduce thermoacoustic instabilities and minimize emissions of lean, pre-vaporized, pre-mixed and lean direct injection combustors. ECE Lead: William Baumann