

Vivid on-line videos demonstrate Superbot progress

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SuperBot modular robotic units assemble into a circular structure able to roll like a wheel. Credit: USC Information Sciences Institute

Wei-Min Shen of the University of Southern California's Information Sciences Institute recently reported to NASA significant progress in developing "SuperBot," identical modular units that plug into each other to create robots that can stand, crawl, wiggle and even roll. He illustrated his comments with striking video of the system in action, video now posted on line.

Shen's presentation took place at the Space Technology and Applications International Forum 2007 (STAIF) held in Albuquerque, New Mexico.

For the report, he first offered a description of the SuperBot work:

"Superbot consists of Lego-like but autonomous robotic modules that can reconfigure into different systems for different tasks. Examples of configurable systems include rolling tracks or wheels (for efficient travel), spiders or centipedes (for climbing), snakes (for burrowing in ground), long arms (for inspection and repair in space), and

devices that can fly in micro-gravity environment.

"Each module is a complete robotic system and has a power supply, micro- controllers, sensors, communication, three degrees of freedom, and six connecting faces (front, back, left, right, up and down) to dynamically connect to other modules.

"This design allows flexible bending, docking, and continuous rotation. A single module can move forward, back, left, right, flip-over, and rotate as a wheel. Modules can communication with each other for totally distributed control and can support arbitrary module reshuffling during their operation.

"They have both internal and external sensors for monitoring self status and environmental parameters. They can form arbitrary configurations (graphs) and can control these configurations for different functionality such as locomotion, manipulation, and self-repair."

Shen illustrated his words with SuperBot action video showing these processes.

He and his colleagues and students made the films in just one week, immediately after completing the mechanics and electronics hardware for the latest batch of SuperBot modules at the beginning of February.

"The fact that SuperBot can achieve so much in so short a time demonstrates the unique value of modular, multifunctional and self-reconfigurable robots," Shen said.

Follow the links below to view .wmv files of some of the videos:

Rope climbing between buildings:

<http://www.isi.edu/robots/superbot/movies/Feb2007/ropeclimber.wmv>

<http://www.isi.edu/robots/superbot/movies/Feb2007>

[/fastropeclimber.wmv](http://www.isi.edu/robots/superbot/movies/Feb2007/fastropeclimber.wmv)

Rolling:

<http://www.isi.edu/robots/superbot/movies/Feb2007/rollingtrack1.wmv>

Caterpillar on beach and in room:

<http://www.isi.edu/robots/superbot/movies/Feb2007/beach-caterpillar.wmv>

<http://www.isi.edu/robots/superbot/movies/Feb2007/rough-catapillar.wmv>

<http://www.isi.edu/robots/superbot/movies/Feb2007/caterpillar.wmv>

<http://www.isi.edu/robots/superbot/movies/Feb2007/ninja-caterpillar.wmv>

<http://www.isi.edu/robots/superbot/movies/Feb2007/hard-at-work.wmv>

Climbing on sand dune, river bank, and in room:

<http://www.isi.edu/robots/superbot/movies/Feb2007/sand-climber.wmv>

<http://www.isi.edu/robots/superbot/movies/Feb2007/climbcreek.wmv>

<http://www.isi.edu/robots/superbot/movies/Feb2007/carpet-climber.wmv>

Sidewinding:

<http://www.isi.edu/robots/superbot/movies/Feb2007/sidewinder7mod.wmv>

Climbing on a fishing net:

<http://www.isi.edu/robots/superbot/movies/Feb2007/netclimb1.wmv>

<http://www.isi.edu/robots/superbot/movies/Feb2007/netclimb2.wmv>

Carrying a camera:

<http://www.isi.edu/robots/superbot/movies/Feb2007/climberCam.wmv>

Walking:

<http://www.isi.edu/robots/superbot/movies/Feb2007/walker1.wmv>

Butterflying:

<http://www.isi.edu/robots/superbot/movies/Feb2007/t-swim.wmv>

<http://www.isi.edu/robots/superbot/movies/Feb2007/creep.wmv>

Collaborations:

<http://www.isi.edu/robots/superbot/movies/Feb2007/synch-swim.wmv>

Searching and connecting:

<http://www.isi.edu/robots/superbot/movies/Feb2007/docking.wmv>

Shape shifting:

http://www.isi.edu/robots/superbot/movies/Feb2007/reconfigure_shape_dependent.wmv

Source: University of Southern California

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