

Swimming through sand

A lizard-like robot created by a Goan scientist in the US, which can navigate through sand, promises to be of much use in the aftermath of war or disaster. **T.V. Jayan** reports

Young Ryan Maladen is ecstatic. With good reason too. The Indian doctoral student at Georgia Institute of Technology, the US, recently won an award at a conference — called Robotics: Science and Systems, held in Spain — for his creation, a robot resembling a wooden snake toy.

The robot Maladen designed and built, with the help of senior colleagues, is different from the bevy of automated machines that has been around. Unlike those that crawl on land or swim underwater, Maladen's robot — developed at the Complex Rheology and Biomechanics (CRAB) lab at Georgia Tech



The robot that Maladen built

— is capable of navigating through sand.

The sand-swimming robot is a culmination of years of hard work required to understand the principles of motion in deformable media like sand and mud. Moving through sand is not easy as the matter behaves like both solid and liquid. "One needs to study birds and fish to comprehend the principles of motion in water and air. My aim was to identify an animal that spent most of its life moving within sand so as to understand the general principles of subsurface locomotion," he says. "The natural choice was desert-dwelling lizards, the champion of which is the sandfish (*Scincus scincus*)."

The 10cm-long sandfish lizard is unique in many ways. With the help of a wedge-shaped snout and short and sturdy legs, it burrows into sand and moves effortlessly through it. Once under the surface, it tucks in its limbs by its sides and propels itself forward by wiggling from side to side. Despite the friction, the reptile is able to travel half a kilometre in an hour.

Maladen and his advisor Daniel Goldman studied the motion of sandfish, working out the biomechanics. The work, published in *Science* last year, attracted considerable attention. The detailed observation came handy in

creating a computer model which subsequently led to the designing of the 48cm-long robot. The contraption won him the prize at the robotics conference held at the Universidad de Zaragoza in Zaragoza, Spain, in June.

The robot can have many applications, says Maladen, who did his schooling in Delhi before moving to Pune for a degree in electronics engineering. It can serve as a search-and-rescue device in the aftermath of a disaster such as an earthquake or a mine collapse. On the military front, it can work as a stealth robot or be used in the detection of landmines in desert environments.

Maladen — who also spent two years at the Centre for Biomedical Engineering, Indian Institute of Technology, Delhi, and subsequently did a masters in human biomechanics from the University of Delaware — was the first doctoral student at the CRAB lab, headed by Goldman, assistant professor of physics at Georgia Tech.

His passion is interdisciplinary research, drawing motivation from biology to answer questions in physics, as well as aid the development of engineering applications by way of robotics.

"I eventually hope to return to India and continue working in the area," says Maladen, who like most Goans loves soccer.