

# 'Smart crane' for precast building

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The "smart crane" system being tested at the Signature at Yishun executive condominium site. ST PHOTO: ONG WEE JIN

## Using cameras, GPS and microchips, NTU system tested successfully at Yishun site

With the help of microchips, cameras and satellite tracking, massive tower cranes could Someday be controlled remotely, instead of from a cabin high above the ground.

To do this, a computer program calculates the optimal lifting path and a smart camera lets the crane operator see exactly what he is doing. With Global Positioning System (GPS) tracking, he can also see how well he matches the suggested path.

Developed by Nanyang Technological University (NTU) researchers, this "smart crane" system was tested recently at the Signature at Yishun executive condominium site by Kimly Construction.

It also includes microchip-enabled tracking for precast parts. Precast construction is a productivity-boosting method, yet can still be very labour-intensive, said Kimly Construction director T. J. Choo.

For instance, workers have to manually record each concrete part when it arrives on site. But with NTU's system, each slab has a Radio Frequency Identification tag.

Workers simply scan each item when it arrives. The information is fed instantly into a digital database, and integrated into a virtual Building Information Modelling (BIM) model of the project.

As each slab is hoisted into place, the virtual model of the building is updated in real time.

"From the beginning, its electronic info that can be passed from one process to another," explained NTU research fellow Meghdad Attarzadeh.

## **“GAME-CHANGER**

*The dream is for a game-changing 'smart crane' system.*  
NTU ASSOCIATE PROFESSOR ROBERT TIONG”

All this means productivity gains of 10 to 20 per cent for site logistics, and time savings of up to 30 per cent for inventory checking.

The BIM model is also used to calculate the most efficient and safe lifting path for each object. A GPS sensor on the crane hook tracks how closely this path is being followed.

Operators of tower cranes often do not have a clear view, and rely on signalmen on the ground.

But with a smart camera on the crane hook, they can view a video feed of exactly what they are doing.

"For the first few elements, it was a challenge (for the crane operators)," said Mr Choo.

"But by the last few, when they had built up the confidence, the speed really picked up."

NTU Associate Professor Robert Tiong, who led the research team, said: "The dream is for a game changing 'smart crane' system."

In the future, the system could allow cranes to be operated remotely, he added.

The collaboration began in December last year, with researchers spending months developing and testing the system.

Over six weeks in October and November, it was then used to construct the 10th and 11th floors of two blocks in the project.

The trial was fully funded by the Building and Construction Authority's Productivity Innovation Project Scheme.

The NTU team is hoping to test the system with partners such as national industrial developer JTC Corporation, while Kimly Construction is keen to continue using the system in suitable future projects.

"It helps the (precast) process become a more systematic method of construction," said Mr Choo.

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