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GAMING IN DISASTER MANAGEMENT WITH CONSTRAINTS, OBJECTIVES

Gaming in disaster management with constraints, objectives

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First Published: Thu, Jan 06 2011. 12 30 AM IST

Updated: *Sun, Jan 09 2011. 05 41 PM IST*

Bangalore: The screen could just as easily be a frame from Half Life, one of the largest-selling first-person shooter (FPS) video games worldwide. Except you aren't a physicist shooting zombies. You are a cop reacting to a terror attack on Bangalore's Garuda Mall.

Loading video...

The mall is a painstaking simulation—complete with an automated teller machine by an entrance, palm trees and even some temporary road dividers out front. The keyboard lets you walk, run, strafe, jump and handle objects with an enviable smoothness.

The Centre for Study of Science, Technology and Policy (CSTEP), a non-profit body in Bangalore, is developing the yet unnamed game as a sub-project of a larger collaboration on disaster management technology. It will be a multiplayer game, supporting paramedics, policemen, firemen and building security guards. Each of these players will interact within the simulation, allowing an observer to develop protocols for disaster management.

The collaboration is with the Bangalore-based Centre for Artificial Intelligence and Robotics, a laboratory of the state-run Defence Research and Development Organisation.

For the game, CSTEP is using the CryEngine3, the latest version of the game engines that have powered FPS games such as Far Cry and Crysis.

“It is an expensive engine,” says Bharath Palavalli, a computer scientist with Next Generation Infrastructure Lab (NGIL), a team of 14 at CSTEP that’s designing the game. “But the developer (Crytek) shares it on a non-commercial (basis) with not-for-profit organizations like ours. Assets like the Garuda Mall simulation and artificial intelligence that we develop for this game will go back to the developer’s library.”

Headed by information systems scientist Eswaran Subrahmanian and economist Robin King, NGIL is a team of youngsters with a modal age of 28 and backgrounds as diverse as animation, computer science, design, information visualization, social science, and urban planning and policy.

Working out trade-offs

Over the past year-and-a-half, the team has been developing both paper and computer-based games in the areas of energy policy, power price discovery, and supply-chain management.

While each game is unique, their basic principle is the same—offering an artificial environment that gives players a set of constraints, lines of action and a common objective. Artificiality is key—it saves resources expended on practical training and lets multiple scenarios to be played out at a lesser cost.

“Each player or stakeholder in the game has a different version of the problem,” says Palavalli. “So they work out their trade-offs and arrive at a consensus that may or may not have been expected.”

Take CSTEP’s energy policy game, for example. Designed for policymakers—specifically for the Planning Commission (PC), Central Electricity Authority (CEA) and the ministry of new and renewable energy (MNRE)—this game has been played 15-20 times. However, the players always found it tough to add 82,200MW of generation capacity, the figure recommended for the 12th Plan by the working group on power in its 2007 report.

“Each authority has a constraint,” explains Palavalli, “CEA has to keep energy cost below Rs3 per kWh. MNRE has to keep CO_2 emissions below 20% and the Planning Commission has to keep its budget down.” Their common goal is to explore sustainable energy options.

“It turned out,” says Palavalli, “the MNRE could go a little easier on CO_2 emission constraints, the PC didn’t mind spending a little more on capital investment. The only rule that most people would not break was the Rs3 per kWh price limit.” And, of course, the objective still wasn’t met.

There is also the concept of private and public messages, which players can exchange among themselves. “This helps model the real-life problem of communication silos in organizations,” says Palavalli.

There is room for improvement, though.

“For it to be really useful for the Planning Commission, it has to bring in a lot of detail,” says Vivek (who only uses his first name), partner, energy, utilities and services at Infosys Consulting, who has played the game as a CEA representative. “Such tools can be very powerful, but if they are oversimplified, they can lose their rigor and analysis,” adds Vivek.

Social impact

So, why can’t these games be fully simulated to try out all possible combinations? “These games aren’t entirely technical problems,” answers Palavalli. “Each issue has an enormous social impact. Dam construction would mean the displacement of a number of people, for example. These things get factored in better in a game like this. Also, it is quick and dirty, compared with an end-to-end simulation, which will take ages to build.”

The games don’t just model real life, but often throw up unforeseen factors and risks. Mango Market, one of NGIL’s older games, is an agricultural supply-chain management tool that allows a player to take on the role of a dealer. Each dealer has to get his inventory of Alphonso mangoes to a given market. Constraints include fast-ripening mangoes and transport time.

The dealer can negotiate with his counterparts in other cities and even introduce interventions such as cold storage, crop insurance, transport and storage options, and credit institutions. A policymaker watching this game would be able to measure exactly how each of these interventions improves the efficiency of the agricultural market.

Jayanth Raghothama, a computer scientist at NGIL who is working on the game, says it took months of playing to realize that the motive of real-life dealers was different from what the game assumed. “A dealer, who buys only as much produce as (he) wants from farmers, and doesn’t give them a say in setting price, has no incentive to reduce wastage. This constraint didn’t apply to him at all, so we had to tune the game to reflect this.”

Each of these games is being developed in partnership with some organization or the other. A power-price discovery game is a collaboration with the Delft University of Technology in the Netherlands. Designed for European energy

markets, gamers take on the role of power producers who bid everyday to supply power at a certain price. “Games for policymakers are accepted tools of training worldwide,” says Palavalli.

Much work has been done in this area by researchers such as Richard Duke and Jack Guerts in the 1970s, and institutions such as Delft have programmes in this area.

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