

MONITORING CONSTRUCTION PROGRESS WITH SPOT

As part of Boston Dynamics' Early Adopter Program, Foster + Partners has been exploring the use of Spot®, the agile robot that climbs stairs and traverses rough terrain with ease as a tool to capture and monitor progression on-site.

The practice's Applied Research + Development group (ARD) has been working with Boston Dynamics to explore the potential of a robot in a dynamic environment such as a construction site, capturing changes on a regular basis, and being able to easily compare the 'as-designed' models against the 'as-built' reality.

Construction sites are inherently dynamic environments, where changes need to be tracked and measured on a regular basis, capturing errors in time to meet the project timeframe and budget. With several contractors working in tandem on site, there is a need for a process that can allow for constant, quick and consistent precision monitoring of the works, which can ensure that potential deviation from the design – which may affect later works – can be picked up on time. Sequential scans also help supervise procurement and logistics and ensure that time[1]frames can be kept under check. If done manually, the process is time consuming and may potentially yield scans that cannot be easily compared against each other. Spot can be controlled remotely, is terrain-agnostic and can also repeatedly follow a pre-mapped route – while avoiding obstacles or even climbing stairs – making it an optimal tool to be used to scan building sites on a regular basis with minimum resources and time.

Using our Battersea Roof Gardens mixed use project – part of the third phase of the Battersea Power Station development – as a testbed, the team devised a map to roughly set up the missions Spot needed to follow on site in order to scan certain areas and capture specific data. Returning to the site on a weekly basis allowed Spot to re-run the same missions with the process yielding a sequence of highly comparable, consistent models. Martha Tsigkari, Partner, Foster + Partners said, "The ability of Spot to repeatedly and effortlessly complete routine scans, in an everchanging environment was invaluable not only in terms of the consistency but

also the large amount of high-quality data collected. Through this process we developed a sequence of cans that may help us track the project progress against timeframes as well as facilitate regular comparisons against the BIM model. Our scans can ensure that very quick as well as accurate changes to the newly designed system could be made to accommodate the differences captured by the scans – all in a matter of days. This could result in savings both in terms of time and money.”



Spot completes routine scans and collects data.



Features and aspects of Spot being checked.

Credit: Balfour Beatty/Robotics + Project 4



Spot can be controlled remotely.



Spot can effectively scan and monitor progress of construction, saving up on time and money.

Spot has also been instrumental in constructing a digital twin of the Foster + Partners campus in London. Spot's Autowalk functionality allowed the team to build up a four-dimensional model, showing how the space changes over time. Adam Davis, Partner, Foster + Partners, said, "Combining temporal and spatial information with data from sensors that read environmental conditions and occupancy, we can construct an intricate model of how people, furnishings and environmental conditions interact. This, in turn, helps us to operate our premises more efficiently and to anticipate how new designs will perform. "What made the adoption of Spot robot technology feasible and fruitful in such a short amount of time was the extraordinary support we received from Boston Dynamics throughout the process. We look forward to continuing our work with them to push the boundaries of innovation in the construction industry," added Tsigkari. The practice's own campus and Battersea Power Station proved ideal testing grounds for the project and the client and construction teams for the latter were very

supportive of the project. Scott Grant, Head of Phase 3 at Battersea Power Station, said, "We were delighted to assist Foster + Partners in using Battersea Roof Gardens as a test bed for Spot. The team explained how the robot can be used on a construction site and the various benefits it could bring. We were excited to see it in action and have enjoyed having Spot on site."