High-Speed Inline Inspection of Artificial Turf

Ajile received a request for help from a manufacturer of artificial turf. This material is produced by knotting small tufts of green polymer 'grass' into a plastic backing sheet.

After knotting, the resulting surface is coated with a liquid glue, which when dry holds the knots in place. This manufacturer doesn't coat the entire back of the grass but rather extrudes a thin line of glue along the line of knots. In the process the glue line can wander from the knot line, causing product problems. Also the glue extruder can clog up so there is no glue on the knots.

The request was to inspect the process to detect any and all of these problems in real time.

This request presented a number of difficulties. Firstly, the grass is moving at 15 cm/sec or 6 inches per sec. Secondly, the light grey glue needed to be distinguished from the green knots and its presence detected on top of the knots.

The task required a fast 3D camera with color capture capability. The Ajile DepthScan camera is a structured light 3D imager which can capture an accurate full colour 4 million point cloud in less than half a second. It also has faster modes of operation which operate at reduced resolution but maintain accuracy.

For this project a color sensor was used, capturing 3 projected patterns per point cloud and running over a PCIe interface at 60 3D images per second.

Since the DepthScan is an area scan system, the same area of the moving web will be scanned multiple times as it travels past the camera. Data from these multiple captures can be integrated together using timing from the web drive to generate high quality 3D images.

A test system was constructed so that a sample of the artificial turf could be moved past the camera at up to 15 cm/sec. The back of the unglued turf sample was then 'glued' so that a number of the problems (no glue, glue off the knots, etc.) were present.

The system was tested to prove its capability to identify the problems. The results indicated that the DepthScan could correctly detect the process problems even at 15 cm/sec.
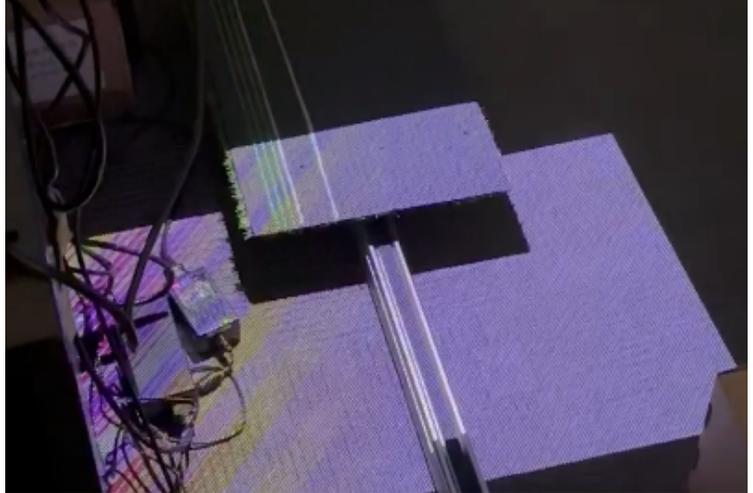
The DepthScan has a particular set of features which made it suitable to solving this problem.

It can operate over a deep working volume allowing different fields of view for different applications.

It captures full colour point clouds, with perfect 3D data to colour registration since the same optical path is used for both.
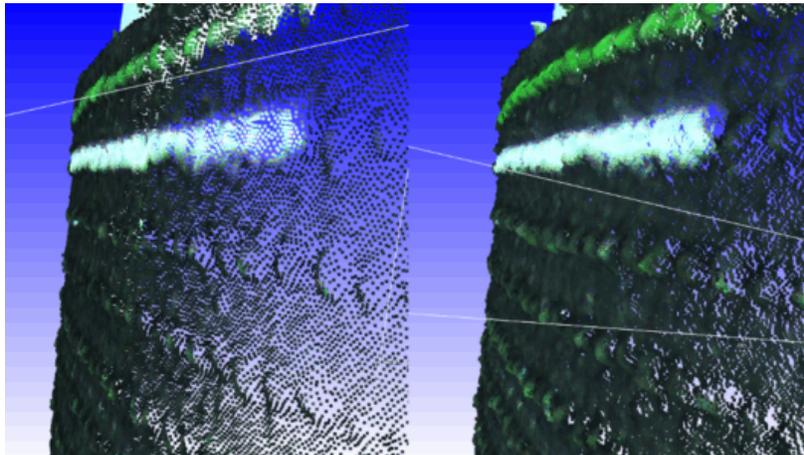
It also has a range of operating modes including a wide range of capture speeds using different pattern sets. Importantly, Ajile as a company has the capability and willingness to adapt its software to solve particular problems.

Ajile provides complete inspection solutions including turntables and robotic part handling. The Ajile software manages capture, filtering, stitching, surfacing and analysis. We also integrate smoothly with 3rd party software such as Polyworks, providing seamless automated inspection solutions.