Adaptation of a Task-Oriented Agile Workcell - Automatic Robot Taping

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PROJECT DESCRIPTION:

Motivation & Objectives
The process of taping (covering objects with masking tapes) before conducting surface treatments (such as plasma spraying and painting) is tedious and arduous. This project aims to do surface covering process using masking tapes with the introduction of an automatic robotic system and corresponding software algorithm. Researchers will delve into the design of the automatic system working with a robot manipulator, a rotating platform, a 3D scanner and specific taping end-effectors for this process. The taping process requires correct tape orientation and proper contact to attach the masking tape to the surface. Meanwhile, the taping path intending to cover the region of interests is introduced. In such taping solutions, the taping tool and the taping software can be combined to form a very useful taping package for the taping related industrial process such as plasma spraying, surface protection. Such taping solutions comprising of taping tool and taping software combined to form taping packages, can be commercialised for robot taping.

Methodology
The overall taping process is illustrated in Figure 1.

![Figure 1: Working flow of the taping](image-url)
In the automatic robot taping system, in order to realize the robot taping, a motion planning strategy based on the 3D digital model of the part to be taped is very crucial. This is because when it comes to repairing works; there is no standard CAD model of the broken part (due to deformation, breaks, losing of material etc.) As a result, a 3D scanning device is used to get the digital model. Meanwhile, having a useful end-effector to realize the taping motion is also crucial. The path planning of the taping process is certainly not trivial as there are many geometric constraints among the object surface such as the taping tool on the robot and the masking tapes during the taping process.

**Taping tool**: In this project, a taping tool with proper tape holding, guiding and attaching mechanism is designed to fulfill the task requirement. A cutting tool is used to separate the taping segments.

![Taping Tool](Figure_2:Taping_Tool)

**3D Scanner**: The scanner is used to get the 3D model of the object for taping. Path planning of the taping depends on it.

**Software package**: The corresponding software for taping utilised in this project enables the user to realize the automatic taping process. It includes:

- The acquisition of the digitized model based on the scanner and model editing.
- The selection and identification of area of interests for taping.
- The robot & platform path generation based on the planning strategy and the taping tool.
Results / Progress

The robot system can execute the taping process based on the generated path.

**GRANT:**
$1,113,600.00, A*STAR SERC Grant #12251 00005, 1Sep 2013 – 31 Aug 2016

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**PUBLICATIONS:**

**Refereed Journal (Published/In Press):**

**Refereed Conference (Published/In Press):**