

## **A Force-Controlled Portrait Drawing Robot**

There has been a lot of research in recreational uses of robots. A robot drawing the portrait of a human face is one such famous task. This makes the robot behavior more human-like and entertaining. There have been several demonstrations of portrait drawing robots in past few years. But the existing techniques can draw only on pre-calibrated and flat surfaces. This paper demonstrates a robot equipped with force sensing capability that can draw portraits on a non-calibrated, arbitrarily shaped surface. The robot is able to draw on a non-calibrated surface by orienting its drawing pen normal to the drawing surface, the pen's orientation being computed from the forces being sensed. In this way, the robot is also able to draw portraits on arbitrarily shaped surfaces without knowing the surface geometry. This avoids the need for calibration of robot with respect to the drawing surface. A number of portraits were drawn successfully on a flat surface without calibration. Also a map outline was drawn on a spherical globe to demonstrate the ability of robot to draw on an arbitrarily shaped surface.