Spot Picker Robot

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Spot picker robot is an indigenous three-axis robotic system designed for precise spot excision to accurately pick spots from 2D gel electrophoresis (2DGE). It transfers the picked protein into micro plates for analyzing protein expression. This finds application in protein research and developing new biomarkers and drugs.

The spot picker robot features the non-separable wavelet based novel imaging algorithm, better design of light illumination for detection of faint, irregular and overexposed protein spots in a non-linear background and generates more accurate reference coordinates of a dynamic protein object. Image resolution is of the order of 7 microns. The system includes a high performance solenoid controlled surgical grade protein spot excision tool and a novel wavelet based accurate positioning algorithm to reduce the effects of jerks on the system. Three-axis positioning is servo-controlled with necessary built-in software and hardware interlocks giving positional resolution of one micron and repeatability within $\pm$ 10 microns. This is achieved with the help of servomotors, high resolution encoders, precision ball-screw drives, an advanced control system and a well damped table. Working gel image area is 160 x 180 mm. Fig. 1 shows the spot picker robot, Fig. 2 shows the spot cutter, Fig. 3 shows a typical 2D electrophoresis image analysis and Fig. 4 shows excision of protein spots.

The system acquires the image, analyzes it and presents the segmented result of protein spots to the user for automated picking of the system. However, system is also built with the provision of manual picking of the particular spot. The centroid coordinates of the spots in the image plane are converted into the robotic plane thus the robot cuts, picks and delivers the spots. After ultrasonic cleaning of the cutting tip, the robot picks the next spot and thus the cycle continues.

This robotic system is a low cost biomedical system which demonstrates state-of-the-art technology in precise positioning and powerful imaging algorithm in the field of proteomics. This system has been delivered to RMC, Parel for use.
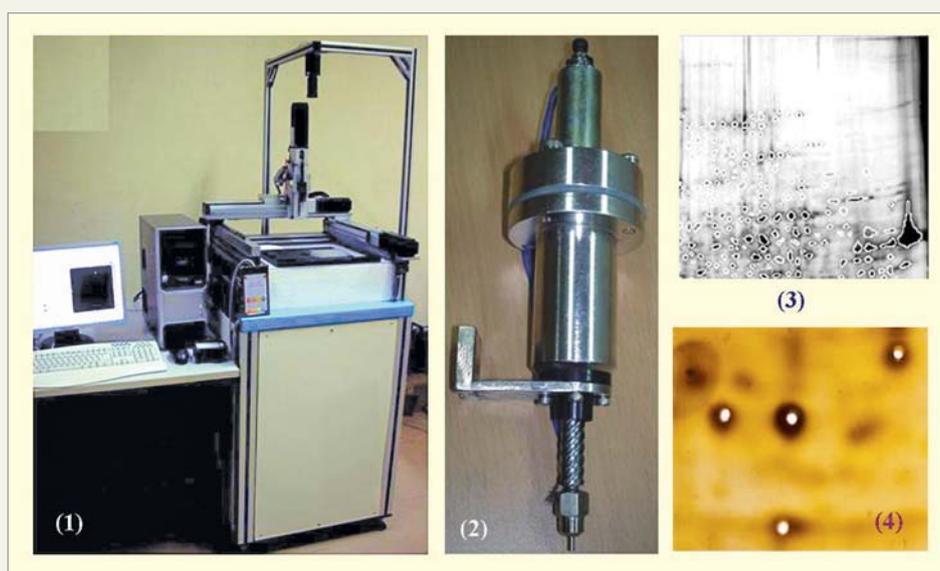

Fig.1: Spot picker robot, 2: Spot cutter, 3. 2DGE Image analysis, 4. Excision of protein spots