**First Prize in event Prototype at Cognizance-IIT Roorkee**

Date: March 17, 2016

Winners: Arvind Kukreti, Naman Khanduri, Neeraj Shah  
Objective: To design a solar tracker, capable of following the sun's trajectory across the sky accurately.  
  
 Report  
On March 17, 2016, a team comprising of Arvind Kukreti, Naman Khanduri and Neeraj Shah participated in the event 'Prototype' of the ECE Department of IIT Roorkee, conducted as a part of 'Cognizance' - their annual technical festival. The objective was. Prior to the event, the team worked out the concept, implemented it on hardware, debugged the code and made their prototype work to perfection.

To fulfil the objective, the team adopted an approach perhaps never used before. They intended to make a truly universal solar tracker. With the help of standard mathematical formulae, they calculated the sun's azimuth and elevation angles. However, the use of these formulae required latitude and longitude data to be fed into the Arduino continuously. Unable to procure a GPS module, the team improvised and used resources that were readily available. An ordinary Android smartphone with a built-in GPS was used to transmit location information to a PC via the Transmission Control Protocol (TCP). This information was then forwarded to a COM port on the PC using VSPE, an open source software package. The information thus available at this COM port was then serially read into the Arduino at 115200 baud.

However, the task did not end there. A GPS transmits in the form of National Marine Electronics Association (NMEA) strings, which, in their default state are inherently unreadable. To extract the useful GPS coordinates, date and time, functions of the 'tinyGPS' library were used. Once obtained, the required parameters were used to calculate the azimuth and the elevation angles.

The team opted to use a stepper motor to actuate the azimuth, and a servo to actuate the elevation. The code for elevation performed brilliantly, but the one for the stepper proved to be a big headache. Unlike a servo, a stepper has no feedback mechanism. Thus, it is impossible for the Arduino to know if the required number of steps have been taken by the stepper. This creates synchronisation issues. The team had to put in extra effort to adjust and sync the timing of the two to obtain the correct balance. The timing was set right.

The team's labour finally bore fruit on the day of the final presentation. The prototype worked as expected, chasing the sun superbly, and impressing the panel of judges. The team were declared the winners for their remarkable project.