IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

Project Title:	Enhancement of 2D sketcher for sophisticated CAD drawings applications	
Project Number	IMURA0276	
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Research Academy Themes:

Highlight which of the Academy's Theme(s) this project will address?
(*Feel free to nominate more than one. For more information, see www.iitbmonash.org)*

1. Advanced computational engineering, simulation and manufacture

The research problem

This project will be focusing on provision of graphical output to the user with **minimal user input** and will **suggest the probable geometry** as well as its **related constraints to the user**. This project will intend to develop a system whereby, the user need not inform the program, what he or she intends to sketch; the software itself will come up with the suggestions in real time based on the free hand sketch drawn by the user.

The developed program under this project will identify basic geometric entities such as lines, curves, ellipses, parabolas, hyperbolas, conic cures and synthetic curves. These identified entities will get immediately displayed on the screen for guidance to the user. User may select the suggested entity, modify it or may sketch its own. The facilities such as scaling, dimensioning, parametric modelling and constraining will be provided. The challenging issues like arrays and symmetry will be supported with faster algorithms.

The geometrical **constraints** like perpendicularity , parallelity, tangentiality **will get automatically applied** to the entities drawn. The new entities, user is willing to draw will automatically get snapped to the end of the existing entities at the logical place. This will reduce the operations such as trim and extend, allowing the user to perform drawing work faster.

The drawn **sketch can be parameterized** and will be made transformable. The transformations such as translation, scaling, reflection (mirroring) and rotation can be applied. While transforming such sketch, all the already applied constraints will be preserved. The sketcher **will** also **identify similar entities** and will highlight them with same colour, as a group. User may also group such entities. Editing of one of the entities in the group will get reflected into change in similar other entities present in the group.

The 2D sketcher program **will** also **support synthetic curves** like Bezier and B-splines. The continuity of these curves can be maintained as per user request and will act as a constraint. Editing facility of these curves will also be

provided.

This project will help the user to work on CAD drawing application using **touch screens**. Current trend of moving from laptops to tablets, this project will open a window for development of such type of intelligent, light weight, fast and user friendly software applications.

Project aims

Development of the intelligent 2D sketcher for CAD drawing with minimum user interaction.
Provision to automatically identify and modify geometric shapes, synthetic curves and constraints.Development of optimum algorithms to perform faster 2D engineering drawing

Expected outcomes

- Efficient algorithms will be developed for the 2D sketching.
- A highly sophisticated and reliable software program will be developed for 2D sketching applications.

How will the project address the Goals of the above Themes?

A **highly intuitive and reliable method** of sketching is sought by CAD industry to allow the user to get the quick results. The project will make a contribution towards realising this aim.

Capabilities and Degrees Required

- Mechanical engineering background with sound knowledge of engineering drawing.
- User level experience of CAD software.
- Experience in developing programs for large CAD applications
- Algorithm development for CAD applications