

# iCreate: Problem Statement

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## Abstract

Generative design can be described as a form-finding process that has an evolutionary approach to design. It is the process of receiving the main goals of the design and then calculating all the possible ways to find a solution which meets the given criteria. The project, proposed by Dr. Raffaele de Amicis, utilizes virtual reality to create new tools, using generative design for shaping architecturally complex structures. There are two final results of this project: a program that facilitates the creation of intricate 3D designs using an intuitive user interface, and a project website. Mike Premi of Intel will also be available to help the team members with software and hardware for the project.

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## I. PROBLEM DEFINITION

Today's computer systems utilize many forms of user interfaces that allow users to seamlessly interact with their electronic devices. However, computer systems today are also becoming more sophisticated, and as they are being improved, alternative methods of user input and interface potentially form the basis for a new generation of user interfaces greatly needed in architectural and industrial design. The new interfaces will remove the need for artificial dialogue constraints imposed by older user interfaces, allowing the user to have a more natural experience.

Additionally, the lack of a highly intuitive user interface is most notable in virtual reality applications. Virtual and augmented reality hold the potential to be ground zero for the birth of a completely new user interface that allows the user to virtually enter their own canvas in 3D space and bring their imagination into reality with simple sketches in just a few seconds, instead of the user having to go through an extensive design and sketching process.

Thus, the overall goal of this project is to improve the efficiency of the interaction between the user and the program via multiple innovative modalities. These methods would be required to adapt to the specifications and requirements that are needed for the development of architecture and industrial designs.

## II. PROPOSED SOLUTION

The solution for this project is to use Unity and other 3D modeling software to create a program that spawns basic geometric shapes and combines them with an algorithm. The program will then generate the 3D figure that transforms the shape to follow the path of the equation. The resulting shapes can be instantiated multiple times with a new algorithm to create an innovative architectural design. The user interface for this program will either incorporate user gestures or an analog stick as the method of usability and the final decision will be determined by user study or depending on the hardware that is used for the final product.

In addition to the three deliverables that are required for the completion of this project, which are a User Requirement and Task Analysis report, a System Architecture Report, and the 3D Modeling and Assembly program, the team will also deliver a website. Due to issues with acquiring a domain name, the team has decided to use Github to build the project website. The website will feature the problem statement, the research, snippets of the code, final results, and the pictures of the team members that worked on the project. This will be a public website that users can visit in order to get a better understanding of the project as well as survey some of the designs created by the program.

## III. PERFORMANCE METRICS

The project will be considered complete based on the list of requested deliverables when the team has delivered a report on User Requirements and Task Analysis, a System Architecture report, the 3D Generative Design application, and a project website summarizing the team's work. Additionally, the two reports will be considered complete when they cover the entirety of the research and results that the team acquired throughout the duration of the project. Furthermore, the website will be considered complete when it is fully functioning with information on the project that is explained in a way that the general public can understand.

Finally, the most important deliverable is the 3D design program. This program has multiple parts that can be considered as mini-deliverables. These mini-tasks are intended to first get the team to become familiar with Unity and 3D modeling, and then later serve as milestones to track the team's overall progress in developing the main program. The completion of all these deliverables will signify the completion of the project as described by the client, Dr. De Amicis.