**Software Description**

1. General purpose

The purpose of this software is to support visual, performance-based, early-stage architectural design. The software is made of a flexible suite of tools that work on top of a more traditional geometric modeling environment. It allows users to generate, analyze, and select from many different design options, using experimentation and optimization techniques more frequently employed in other design fields.

b. Technical description

The software was created as a series of plug-ins to be used with Rhinoceros 3D, which is a geometric modeler, and Grasshopper 3D, which is a graphical algorithm editor for Rhinoceros. It was written in C#, and consists of compiled components that can be used in creating a Grasshopper script. Each of these components can be used alone, or in conjunction with any other components written by various developers, to generate parametrically defined geometry in Rhinoceros. These components have various functions, including the ability to: generate many different sets of design variables, automatically evaluate these different designs, save images and histories of their performance, reconstruct previously created designs, organize designs into families, or use optimization to find the best performing designs.

c. Advantages and improvements over existing methods, devices or materials.

Using components native to the Grasshopper software, it is possible to create geometry that is defined flexibly based on dynamic variables, rather than rigidly based on static properties. However, within these flexible logics, it can be difficult to systematically find the variable settings that leads to the best design. These tools enable architectural designers and others who use this modelling environment to more effectively interact with a geometric model and methodically explore the different design possibilities, based on how each design performs. Others have developed related tools for generating different design options and organizing them for evaluation, but this software gives greater access to performance-based optimization techniques than other, similar software.

d. Commercial applications (economic potential, etc.)

Architects and engineers of many different types could use this software during the early design process. The software could be used to design a wide range of physical objects at diverse scales, although the developers have focused on applications for buildings and related structures. However, it only works on top of other software that provides the capability to model 3D geometry and algorithmically adjust or instantiate this geometry.