



KINETIC FRAME: THE MECHANICAL PROTOTYPING LEARNING TOOL

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ABSTRACT:

Kinetic Frame, one of mechanical prototyping program using cardboard, is developed as an easy and quick education tool to understand mechanism and application in the course of industrial design. The creative cardboard tools such as Kinetic Frame have potential possibilities to expand its application area to the experience education integrated with the creative problem thinking method, the practical application of mechanisms and the aesthetic form.

1. INTRODUCTION

Mechanisms are being used in broad fields from the kinetic art to the product designing but students are not able to create mechanical designs because the education contents based on kinematic analysis (Myszka 2002) are hard to understand and the learning tools depend on the pre-designed and pre-supplied mechanical kits.

Kinetic Frame is a new concept to learning mechanism. It means two-dimensional kinematic art frame (Fig.1). Kinetic Frame is learning by experience tool to study principles for mechanical application using the cardboard prototyping methods. Students experience the whole process from idea generation to the final model and solve the problems themselves, so they can learn the creative design method, properties and tooling methods of materials and physical mechanisms.

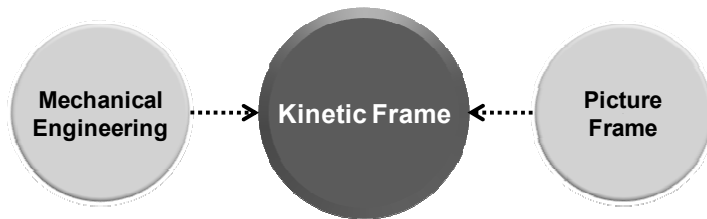


Figure 1: Education concept of Kinetic Frame

2. OBJECTIVES OF EDUCATION

The objective of learning the use of Kinetic Frame is that it makes it easier to understand and apply to the designing process for those students who are have not majored in engineering. Kinetic Frame increases student's abilities in the creative problem solving, the mechanic engineering designing and aesthetic styling.

Goals of Education: To develop the synesthesia from layered design; To experience the integrated design process of mechanics, electronics and aesthetics.



Figure 2: Students woks

3. PROCESS

Students learn the basic mechanisms using simple prototyping tools like paper automata (Ives 2002) and EZ-automata (Kim 2007). For an effective assembly (Booker, Swift and Brown 2005), check the coupling that can be made from two or three parts into one, and define the materials and the manufacturing methods.

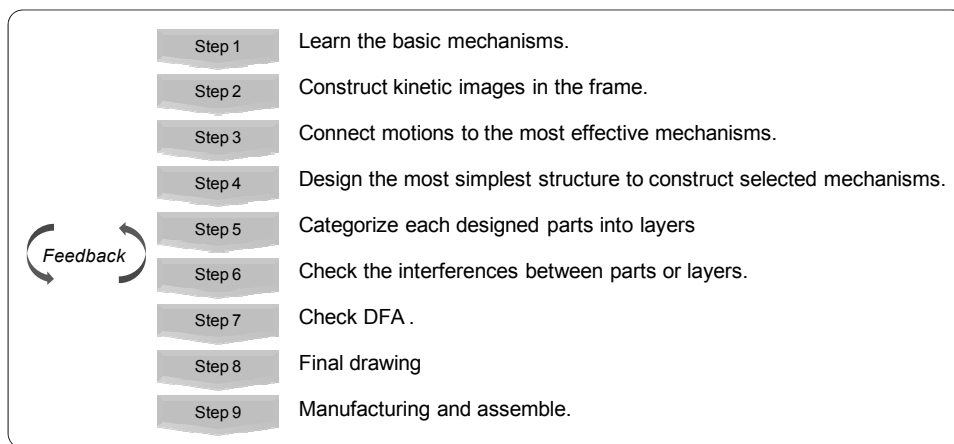


Figure 3: Design process of Kinetic Frame

Kinetic Frame is consists of multiple layer of two-dimensional mechanical structure (Fig.4). In particular, the issue regarding interference and the task of appropriately arranging mechanical elements and images require both two- and three-dimensional thinking.

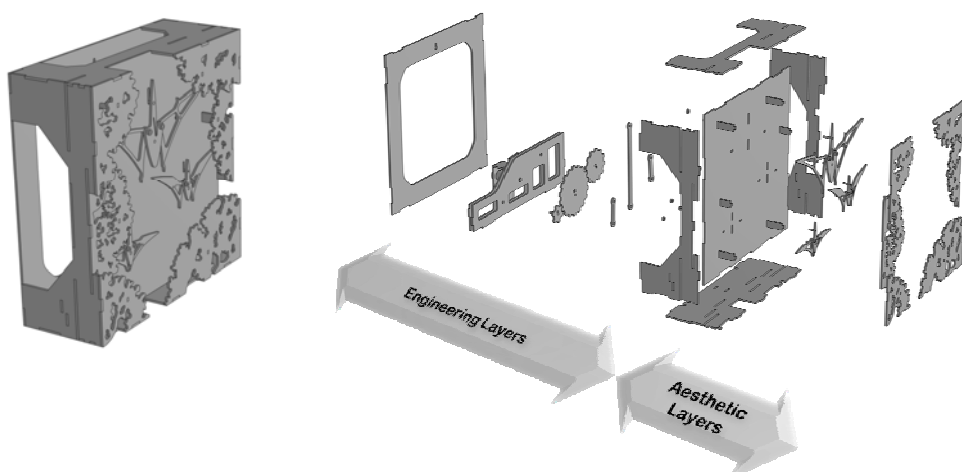


Figure 4: Layer structure of Kinetic Frame

4. EXPANSION OF TOOL

Kinetic Frame using CAD is more effective in design. By connecting laser cutting machine, students can make more quickly and realize the motions more accurately. And an additional process is not required in order to change materials (Fig.5).



Figure 5: CAD works & material changed model

5. CONCLUSIONS

Kinetic Frame is an interesting and creative learning tool which is connected with the artistic aspect of a picture frame and the engineering aspect of mechanisms. Students experience the strong relationship between forms and mechanisms through the process to make kinetic model. Also the making of a kinetic art work increases the student's satisfaction about learning through their achievements, and helps to decrease student's fear in mechanism principles being applied to other genre such as interactive designing.

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