Tilting Tiles
A Stewart Platform Array

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Tilting Tiles, a research project focused on developing a kinetic art sculpture that merges modern manufacturing techniques with electronics design, consists of a series of interconnected triangular modules. Each module, a reduced range of motion Stewart platform, is capable of tilting in two axes and translating horizontally. These platforms, mounted to a wall, collectively form an interactive dynamic surface that displays preprogrammed animations or alternatively responds in real-time to inputs from sensors, cameras, or web-based systems.

The development of Tilting Tiles explores urethane casting and injection molding processes to ensure durable, scalable plastic components. Early prototypes use 3D printing for rapid iteration, while the final version relies on production-grade casting. Each module features custom electronics, including multiple printed circuit boards for power management and microcontroller functionality. The main control unit orchestrates animations through the modules wirelessly. The system is scalable, allowing for installations ranging from twenty-four to several hundred units, making it suitable for large-scale interactive displays in spaces like science museums, offices, or other institutional settings.

Throughout the research, I explore challenges in efficient C algorithm development, inverse kinematics for Stewart platforms, wireless communication protocols, and reducing noise of multiple asynchronous pulse-width modulation signals. Additionally, the project involves designing assembly jigs for rapid, large-scale production. The result, a versatile and visually compelling kinetic art installation, integrates cutting-edge electronics with refined manufacturing techniques.

Tilting Tiles, a comprehensive investigation into the intersection of art, engineering, and technology, contributes new methodologies for kinetic sculptures and interactive installations.

In Progress Research Papers:

Inverse Kinematics of 3-DOF Stewart Platforms or 3-RPS Parallel Manipulators
Avoiding Singularities in 3-DOF Stewart Platforms
Urethane Casting Design Guide
Reducing Noise of Multiple Asynchronous PWM Signals
Additive Manufacturing: Precision for Practical Components

First choice presentation format: **Poster Presentation**

Second choice presentation format: **Visual Arts Display**