The future of engineering will enable seamless collaboration using real-time visualizations in mixed reality, but current input techniques do not match user expectations or intuitions. Our work with ProtoSpace involved designing a new controller input method and gathering insights into designing for mixed reality.

**VERSATILE USER INTERFACE**
Multiple orientations enable users to hold the controller with one or two hands, allowing them to use gestures in combination with the controller.

**ADDED GRANULARITY**
Incremental controls increase accuracy in object manipulations such as moving, rotating, and scaling.

**EFFICIENT PERFORMANCE**
Menu shortcuts permit users to quickly access and switch between commonly used modes.

**USER EXPECTATIONS**
Users wanted mixed reality environments to behave like their real-world counterparts. For example, mechanical engineers expected inputs to mirror those of traditional CAD software.

**INTERACTION DESIGN**
When designing interactions for mixed reality, consider degrees of freedom tracking, interface complexity, and whether users will be required to use one or two hands, or none.

**PROTOTYPING TECHNIQUES**
Immersion is in the details. Providing real-time feedback for controller inputs and recreating the physical experience helped users feel as if they were interacting with a real system.

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**KEY FINDINGS**

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**DISCOVERY**
Uncovered pain points around the gestural interface which was imprecise and difficult to learn, and disrupted design reviews.

**DEFINITION**
Insights revealed a tangible interface may be paired with the HoloLens to improve the ProtoSpace experience.

**IDEATION**
Explored input devices ranging from consumer hardware to future concepts.

**PROTOTYPING & EVALUATION**
Iterated input mapping based on insights from Wizard of Oz usability testing with 12 participants.

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