

Powder Screen: A Virtual Materializer

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1 Introduction

Real Objects have a sense of existence that cannot be represented through the solely displaying of images. Humans are able to perceive properties of materials that cannot be replicated by virtual objects. When we create, deform or handle real objects in the real world we constantly face numerous restrictions. Virtual objects are free from these restrictions but lack real presence. In order to transform the way we interact with and perceive virtual objects, the development of a technology capable of making smooth transitions between virtual and real world was required. This development resulted on the proposed Powder Screen.

The Powder Screen is capable of combining the best of both worlds (virtual and real), resulting on enhanced interactions. Transformations between virtual objects into real objects and vice versa are executed without user's awareness. The screen not only enables materialization of virtual objects, but also adds new interactive features to applications, such as physically touching and grabbing projected objects; differing from other projects [Iwata et al. 2005], by using real object shapes and not just arbitrary shapes.

2 The Powder Screen

The Powder Screen is composed of ultra fine Polystyrene beads of about 0.5 mm of diameter. The small diameter of the beads strongly contributes to the high resolution of the screen. Projections over various type of surfaces have been performed over the years [Hiroshi et al. 2002]. Our project improves existent screens by adding a new feature: the materialization of virtual objects.

Powder Screen allows objects to be completely hidden and moved inside the screen with almost no resistance. To be able to move objects in and out of the screen we created a mechanism that uses the SPIDAR system. SPIDAR (Spatial Interface Device for Artificial Reality) functions by changing the tension and lengths of strings, controlled by motors.

The materialization of objects is one of the many features of the Powder Screen. By combining techniques, such as, exposing the screen surface to controlled currents of air, we are able to create visual effects for a more realistic experience.

3 Application

To prove the functionality of the Powder Screen, an application named "Splash Fishing" was developed. Splash Fishing is a game

that simulates fishing as in real life. During the game, players must catch a projected moving fish that will materialize (come out of the screen on its real form) once is caught.

The real model of the fish (toy model) is connected to the SPIDAR system through four strings. SPIDAR is used to move the real object to arbitrary positions of the screen and is also used to move objects in and out of the screen. By moving the fish on the screen and by sensing the pulling force through the fishing rod (force sensation accomplished by installing a motor into the rod), we were able to emphasize the real presence of the fish.

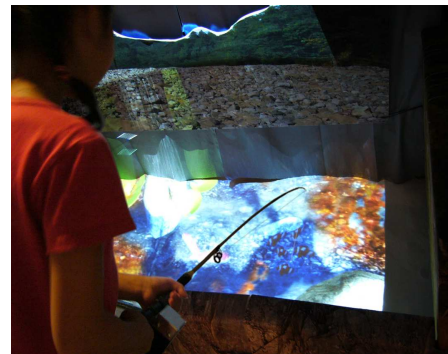


Figure 1: Powder Screen - Splash Fishing Game.

4 Conclusion

By developing and combining the proper elements, we created a new technology capable of transforming the way we interact with virtual objects. The use of powder beads, spread inside an open case as a screen (Powder Screen), allowed the high resolution displaying of images. The incorporation of an existing technology (SPIDAR), allowed the movement of objects and added force interaction to the developed application.

Powder Screen numerous features combined with SPIDAR system added real presence to virtual objects and thus cleared the restrictions that once existed between real and virtual worlds. Our project opens the doors for new developers in the fields of education, entertainment, and marketing, among others, leading into innovative ways of interaction.

References

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