Abstract
In this work-in-progress paper, we describe our demonstration which uses a giant stone ball resting on a water fountain as a method of interaction. By rolling the stone, people could rotate a 3D model of Earth presented on a display next to the stone ball. During a public trial, approximately one hundred people interacted with the system, and it was discovered that manipulating the installation by pushing a heavy object created a unique sense for the interaction.

Keywords
Tangible interaction, urban user interfaces, ubiquitous art, natural element user interfaces, water, stone, inertia.

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous. See [3] for help using the ACM Classification system.

Introduction
Computing technology is becoming ubiquitous in urban spaces, and interactive digital media has become commonplace. Computing interfaces that are embedded
in physical city environments typically utilize interactive public displays, which are nowadays a commonly used platform for a variety of media. Interactive public displays facilitate single-user and multi-user interaction through, e.g., touch [5] or gesture detection [4], where the former is the established interaction technique for the medium. We were interested in creating a media installation utilizing a tangible user interface which uses a novel interaction material, and which would provide a novel perspective to the familiar city landscape.

We designed and prototyped a City Mouse installation, which used natural materials – water and stone - as part of the interaction design. The materials form an important part of the holistic user experience [3]. Earlier studies have reported that using natural materials in the user interface (UI) emphasizes the feeling of playfulness [1, 6]. With our design we aimed to provide an engaging yet calm interactive experience. When taking steps towards Weiser’s vision of a world where computing is embedded in the everyday surroundings [7], the use of natural materials offers an interesting dimension for HCI design.

City Mouse Installation
Our interactive system utilizes the Rotuaari ball sculpture, which is a landmark in the city center of Oulu, Finland. It consists of a large stone ball of approximately one meter in diameter, see Figure 1. The stone ball rests in a spherical stone bowl that has been carefully carved to match the shape of the ball. Water is pumped into the bowl and forms a thin layer in between two stones, allowing the heavy granite ball to rotate when pushed. Our interactive installation uses the rolling of the giant stone ball as an input. By pushing the ball so that it rolls, the user(s) can rotate a 3D model of Earth that is visualized on a screen next to the sculpture, Figure 1.

Figure 1. City Mouse installation at the Oulu city landmark, the Rotuaari stone ball sculpture.

During the two hours of the public experiment, approximately one hundred users interacted with the installation.

Observations on the Use of Natural Materials
The City Mouse installation leans heavily on the hedonistic side of a holistic user experience [2], and engages strongly with aspects such as playfulness and aesthetics. Based on observations and users’ verbal feedback, the use of stone and water in an interactive manner was liked by the audience. Especially the ability to rotate a heavy stone ball created a feeling of magic, bringing delight to the users and encouraging curiosity in the system. The inertia, which causes the large object to respond slowly, gave a peaceful pace to the
interaction. In particular, the materials were perceived as appealing - touching a cold stone, being able to move a heavy object, and the feeling of the running water. All this facilitated the idea of calm computing. Because of the inertia, users had to use force when interacting with the UI, and often lean quite heavily to push the stone, see Figure 2. Having a visualization of the Earth, i.e. a large and heavy entity, as an object of manipulation matched well with the heavy and slow stone ball input.

We observed that people were interested in testing the boundaries when interacting with the tangible user interface. Quite often someone tried to navigate to a location on the 3D globe as accurately as possible, which was somewhat challenging due the inertia of the giant stone ball – the movement was slow to accelerate and hard to stop. However, the tracking of the movement was quite accurate, and people could achieve their target. Moreover, we witnessed several occurrences where the user, or several in collaboration, tried to make the stone ball move as fast as possible, and even tried to make a race of it.

Conclusion
The public trial of our interactive media installation revealed that the prototype facilitated playfulness, audience engagement and delight. Especially the use of a large and heavy component, the giant stone ball, created a perception of a calm and slow-motion interaction, which was found engaging, peaceful, and unobtrusive. Our work expands the horizons of HCI in urban computing, and offers inspirational material for further development of tangible urban UIs. As future work, we wish to carry out a formal user evaluation with the UI and explore the design space more thoroughly.

Figure 2. A child interacting with City Mouse installation.

Example citations