ABSTRACT
Advances in technology provide artists with new opportunities for developing engaging works, however these often push the artist’s technical ability. We address this issue in demonstrating that MIDAS can be applied to artistic practices with relative ease and at a low cost. The authors present, as a case study, A Touching Harmony – a flexible screen-based installation that explores depth as variable within user-interaction. We discuss the use of MIDAS within the implementation of the installation.

Author Keywords
Tactile interfaces, sensor toolkit, audio, touchscreen.

ACM Classification Keywords
H.5.2: Input devices, prototyping, interaction styles

INTRODUCTION
Artists may often conceptualize works that involve the use of digital technologies in order to manifest their idea. Unfortunately, many artists do not have the programming knowledge to allow such ideas to be realized on their own. As Gross notes, “Artists, whose training focuses on skill and tacit knowledge, are marginalized by existing tools”[1]. We address this issue through demonstrating the use of a designer’s interactive proto-typing toolkit, known as MIDAS (Media Interaction Design Authoring System)[2] in the development of an interactive new media installation, A Touching Harmony. In this paper we introduce how the installation was conceptualized and implemented easily through MIDAS. We also describe the implications and the contributions of this project toward artistic practices.

CASE STUDY: A TOUCHING HARMONY
In previous works, such as Han’s Multi-touch display[3] users interact simultaneously with the display, but multiple interaction is limited to a flat surface that provides only haptic feedback. Exploring tangibility, Keep in Touch[4] uses a stretched fabric to provide participants with a soft feeling, however interaction is limited to a single touch. Closer to our project is the Khronos Projector[5], which also uses depth as an interactive variable, but differs in their use of custom “vision chip” software to achieve their goals. Kronos Projector explored the manipulation of video imagery and time, whereas we have created an environment where participants can manipulate abstract imagery with sound elements in exploring synesthesia.

A Touching Harmony is a flexible screen-based instrument, where participants are encouraged to create harmonious audio-visual compositions by applying varying degrees of pressure to different regions of the screen [figure 1].

Figure 1. The use of depth as an interactive modality
Drawing on Kandinsky’s work with synesthesia[6], we mapped color to regions on the 2D axis and linked each region to corresponding sounds. The screen was constructed from Lycra material which provided the participant with a soft texture to touch, while also enabling the ability to push into the fabric by applying pressure. The use of varying degrees of pressure introduces the third dimension as an interaction modality, one that we correlated to sound volume and hue intensity; the further one presses into the screen, the louder the sound and brighter the color is for the specific region that is depressed. Additionally, while pressing into the screen, a warm feeling can be felt, due to the change in hue intensity and proximity of the user’s hand to the projector, which provides an intimate sensation. Also, multiple regions of the screen can be touched simultaneously, which triggers different audio-visual outputs. By combining multiple touch on both the 2D and
3D axes, the user can mix sounds of varying loudness and pitch, while at the same time, creating an abstract visual representation of the sound in real-time that is based upon their expressed gestural form.

IMPLEMENTATION
We began by constructing a flexible screen from Lycra, on which we rear-projected the abstract visual forms that the user could see when interacting with the screen. We positioned infrared lights on the front side of the screen, behind the participant, and placed a USB camera behind the screen to capture the participant’s shadows. The optical interference between input (user’s shadows) and output (projected image) was avoided by attaching an infrared band-pass filter to the camera, which enabled our system to detect the user’s gestures within the infrared spectrum, invisible to the human-eye, while simultaneously displaying the visual composition on the screen. The camera was connected to a laptop computer that was running the MIDAS toolkit, as shown in figure 2.

Figure 2. Screenshot of the MIDAS toolkit in use

MIDAS is a set of software plug-ins for Adobe Director and Flash that provides designers with simple ways to employ physical computing peripherals, such as electronic sensors, motors and PC cameras, in their project. Among the toolkit’s various functions is the VideoTracker component, which we used in combination with a USB camera to capture the participant’s gestures. The activation of this component requires only for the user to drag-and-drop the component’s icon onto the Flash document’s ‘stage’ area. We then calibrated video input by touching various areas of the screen, which allowed MIDAS to gather two-dimensional coordinates(x,y) into its dataset. The calibration phase took under 20 minutes and was facilitated by MIDAS’ built-in command, motionArray, which stores information about moving objects. In order to track the depth of individual touches, we adjusted the sensitivity of the motionArray, through the superimposed on-screen controls provided by the system.

ANALYSIS
In the implementation phase, MIDAS minimizes the demand for computer programming knowledge by providing WYSIWYG user interface widgets and easy scripting syntax. The various functionalities of MIDAS that were used in this project were applied easily through a few commands, whereas other high-level programming languages, such as C++ and JAVA, would have required many more procedures to attain the same results. In addition, the MIDAS toolkit is freely available, however it does require the use of Flash to function. Regardless, when comparing its functionality to other GUI applications that use video tracking, such as MAX, the system is relatively inexpensive. VVVV is another toolkit that functions much like MAX-Jitter, but is free. However, this toolkit works only on the Windows platform, while many artists work within a Mac-based operating system. MIDAS adapts well to the iterative creative process by making it easy to set up and adjust technical aspects of a project, such as motion sensitivity. Most importantly, the system allows artists to visualize the potential of their ideas early in the creative process, so that new directions can emerge based on initial testing.

CONCLUSION AND FUTURE DIRECTION
We have shown through A Touching Harmony that MIDAS is a useful tool for artists with limited technological abilities. We feel that the toolkit could further be improved through the development of a wizard-like application to further automate commands for a variety of artistic-based situations.

REFERENCES