KnobSlider: A Shape-Changing Interface for Parameter Control

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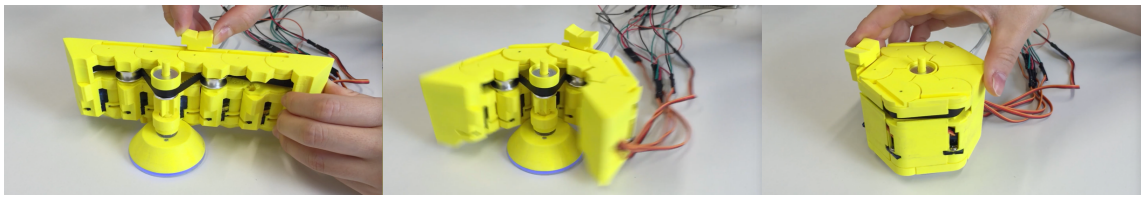

Figure 1. KnobSlider is a shape-changing device that changes between a rotational knob and a linear slider to accommodate users' needs. For example, a sound engineer can use it as a slider (left) to coarsely control a sound volume. He can then press the central button to trigger the change (center) into a knob (right) with low control-display gain for fine adjustment of the same parameter.

***Abstract*— Physical controls are widely used by professionals such as sound engineers or aircraft pilots. In particular knobs and sliders are the most prevalent in such interfaces. They have advantages over touchscreen GUIs, especially when users require quick and eyes-free control. However, their interfaces (e.g., mixing consoles) are often bulky and crowded. To improve this, we present KnobSlider, which combines the advantages of a knob and a slider in one unique, actuated, shape-changing device. KnobSlider's design is based on the results of contextual interviews with professionals who use physical controllers. A qualitative evaluation with professionals shows to which extent KnobSlider supports their requirements.**

I. Introduction

Many professionals (e.g., sound and light engineers, graphic designers, camera operators and pilots) use physical controls to interact with a large number of parameters. The interfaces have evolved little in the past 30 years, and these still use physical controls despite touchscreen technology being widely used and providing flexibility and portability. In fact, physical interfaces are ideal for such professions as they provide haptic feedback and thus eyes free manipulation. Each type of controls has different interactive advantages: the most prevalent are knobs for fine adjustment and sliders for absolute positioning. Knobs, or dials, are buttons controlled via rotation. Sliders are linear control elements consisting of rails and cursors.

In an attempt to provide both physicality and flexibility between controls, we offer KnobSlider, which provides both a physical knob and a slider through shape change. It decreases the interface size and gains portability without losing the different types of controls or their physicality. We believe this is a strong advantage, which was additionally suggested by our qualitative evaluation [1].

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II. Design and Evaluation of KnobSlider

We conducted contextual inquiries to learn about professional use of physical and touch screen controllers. From these, we derive design requirements. Users need fast, precise, eyes-free and mobile interaction with a large number of parameters. They also need retro-compatibility with current interaction.

We explore 9 shape-changing mechanisms that combine a knob and a slider in one device. We evaluate the mechanisms based on design requirements and choose the best mechanism to implement a working prototype (Figure 1). We brought the KnobSlider back to the professional users to evaluate it. This allowed a first qualitative assessment of KnobSlider and showed new design considerations of shape-changing UIs, such as users' perception of shape-change.

III. Description of the Live Demonstration

We will allow participants of the workshop to interact through the prototype of Figure 1 with several applications developed for our qualitative evaluation with professionals [1]. The following applications will run on a dedicated laptop:

- Photoshop, where KnobSlider allows switching between tools or adjusting a tool's size;
- Laser light control, where KnobSlider allows adjusting the size of a rotating laser or the speed of a laser dot's movement;
- Stage projector control, where KnobSlider allows controlling the intensity of a projector or its rotation;
- Sound control, where KnobSlider allows controlling the sound volume;
- Cockpit, where KnobSlider allows controlling the flaps' angle.

The demonstration requires a table, two chairs and two 220V power outlets and possibly, a display.

References

[1] Hyunyoung Kim, Céline Coutrix, and Anne Roudaut. 2018. KnobSlider: Design of a Shape-Changing UI for Parameter Control. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (CHI '18). ACM, New York, NY, USA, Paper 339, 13 pages. DOI: https://doi.org/10.1145/3173574.3173913