Extending Input Space of Tangible Dials and Sliders for Uncertain Input

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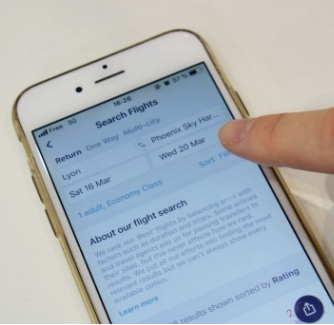
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Booking flights to TEI... felt uncertain?

Uncertainty is common when inputting data, and no standard tangible interface element exists to input uncertain data. We extend the input space of two traditional TUIs: dial and slider.

Why do we experience uncertainty?

A focus group study shows the following causes of uncertain input:

Lack of knowledge Complicated forms such as patient forms demand uncommon knowledge. Another example was the alarm setting for e.g., cooking time, which might vary among kitchen equipment.

Loose constraints Flight search can be uncertain when users do not have a specific price or time in mind.

Uncertain memories Many scenarios can be traced back to missing or imprecise memories. This includes rarely used personal data, for which the participants mentioned their body size and weight.

Design Exploration + Design Requirements for uncertain input TUIs

We extend the input space of dials and sliders and create low-fidelity prototypes. We then conduct a focus group interview to draw design requirements for uncertain input TUIs.

Initial Designs

Certain Input / Uncertain Input

Expandable Dial   Pinch Dial   Pressure Dial   Expandable Slider   Split Slider

Low-Fi Prototypes

Design Requirements

No interference between inputs. The participants preferred not to have interference between the value and uncertainty inputs. E.g., changing the diameter of Expandable Dials could rotate the devices by accident.

Easy finalization. With Expandable Dial or Split Slider, the participants were able to take off their hands from and then finalize their inputs.

Small intervals. Dials were preferred for small intervals in value input because they could have infinite input range.

Simultaneous input. The participants liked to have simultaneous input of value and uncertainty. Some interfaces such as Pressure Dial did not allow it.

Force feedback. Participants also liked that Pinch Dial and Expandable Slider give force feedback on uncertainty.

Visual feedback. The participants liked that Split Slider's thumb intervals give clear visual feedback on the uncertainty.

Supporting both experts and novices. Split Slider could express statistical knowledge and support both expert and novice users.