

TUIs in the Large: Using Paper Tangibles with Mobile Devices

Abstract. Tangible user interfaces (TUIs) have been proposed to interact with digital information through physical objects. However being investigated since decades, TUIs still play a marginal role compared to other UI paradigms. This is at least partially because TUIs often involve complex hardware elements, which make prototyping and production in quantities difficult and expensive. In this paper we present our work towards paper TUIs (pTUIs) - easily makeable interactive TUIs using laser-cut paper, brass fasteners, metal bands, mirror foils, and touch screen devices as platform. Through three examples we highlight the flexibility of the approach. We rebuilt the seminal work URP to show that pTUIs can replicate existing TUIs in DIY manufacturing. We implemented tangible Pong being controlled by paper rackets to show that pTUIs can be used in highly interactive systems. Finally, we manufactured an interactive Christmas card and distributed it to 300 recipients by mail to show that pTUIs can be used as apparatus to explore how pTUIs are used outside the lab in real life.

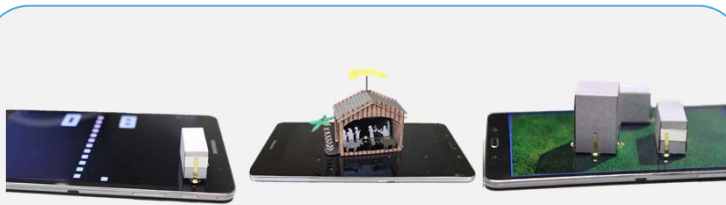


Fig. 1: pTUI examples: Paper Pong, interactive Christmas card., and Paper Urp.



Fig. 2: Construction steps.

pTUI

- Components: thick paper, brass fasteners, a metal foil and a mobile touchscreen device, which runs a specific web application, to detect the position of the pTUI
- Three different pTUIs highlight the flexibility of the approach (Fig. 1).

pTUIs in the large

- Aim: investigating users' experience with pTUIs on a large scale
- Method: distributing pTUIs to a large audience as interactive Christmas card (Fig. 1) from our lab
- Procedure: sending 300 entities via mail to receive initial feedback.
- Besides all hardware components, shown in Fig. 3 (left), and the URL of the web application, our recipients got building instructions (Fig. 2).

Findings

- Two weeks after sending out the Christmas cards via mail, 114 unique users accessed the web application.
- The majority of the users were in Germany (57%). Other countries include the US (21%) and Great Britain (10%).
- Additionally, we collected photos that recipients shared on Facebook or by email.
- We learnt that not all recipients successfully constructed the pTUI they received (cf., building examples in Fig. 3), which highlights the importance of a usable design and instruction manual.
- One error-prone construction step is that at the moment pTUIs must be touched by the user to be recognized by the touchscreen, which we aim to change in future work.



Fig. 3: Construction set the recipients got and built pTUIs made by them, with an increase of similarity to the intended result from left to right.

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