

RAPPORT de PRESENTATION de la THESE

*THESIS SUBMISSION REPORT*

FORMULAIRE A RENVOYER PAR LE RAPPORTEUR

15 jours avant la soutenance sous peine de report de celle-ci

*This report should be returned by the reviewer at least 2 weeks prior to the scheduled date of the public thesis defense.*

*In case of incomplete or late submissions, the final oral defense risks being postponed.*

Nom du candidat *Candidate (Last Name, First Name):* Renaud GERVAIS

Titre de la thèse *Thesis title:* « Interaction and introspection with tangible augmented objects »

1. Evaluation générale *General assessment :*

Digne d’être soutenue, en l'état, en vue du Doctorat ?

***Can the thesis dissertation be defended in its current state?*** OUI *YES*  ~~NON~~ *~~NO~~*

Si non, y a-t-il des modifications à apporter avant la soutenance ?

***If not, are any changes recommended******prior to the******defense?*** OUI *YES*  NON *NO*

2. Evaluation en vue de la soutenance *Evaluation in view of the thesis defense*

Nom, Prénom *Last Name, First Name:* Grade/établissement *Title/institution:*

***Prof. Sriram Subramanian,***

***University of Sussex,***

Date: 24-Nov 2015

Signature :

2. Rapport (2/3 pages maximum) commentant les raisons pour lesquelles vous êtes favorable à la soutenance de cette thèse ou au contraire pour lesquelles vous êtes défavorable à la soutenance en l'état actuel du manuscrit

*Report (max. 2-3 pages) – please detail the reasons in favor of or against the defense based on the current thesis dissertation submitted by the candidate:*

**A partir du 1er janvier 2015, l’Université de Bordeaux ne délivre plus de mention au grade de docteur (*CFVU du 11 décembre 2014*)**

The dissertation is about augmenting tangible objects to support a) New forms of interaction with digital content and b) using these augmentations to enhance reflection and introspection. The thesis uses projection mapping techniques from spatial augmented reality to augment physical objects to create these tangible augmentations and study them.

I enjoyed reading the dissertation and found its organisation easy to follow. The writing style is simple and straight-forward making it easy to understand the line of argumentation. The dissertation has a classical-structure with the first two chapters introducing the topic and providing an overview of the relevant literature. The next four chapters (Chapters 3 to 6) are the main contributions of this thesis. The final chapter provides a short conclusion and identifies some future work.

The first chapter describes the context within which the contributions are situated and present a good overview of the different domains within HCI that explore this area of research. In particular the way in which different paradigms stitch together the space of digital-physical interactions is compelling. For example, the subtle but impotant differences between tangible user-interfaces, Organic user-interfaces, ubiquitous computing and other paradigms are well explained. I would have liked have seen more reflection from the candidate on how his own work fits this grand vision and specifically how each of the main chapters (that make original contributions) contribute to shaping our understanding of the discipline. Some of this reflection is happening in Chapter 7 but it could have also been presented in Chapter 1.

Chapter 2 reviews the literature in Spatial Augmented reality. The candidate is very clear in explaining how this is merely an enabling tool and the review of the literature is meant to help the reader understand how the tool is used. This is good way of structuring the related work section. It is often hard to know which piece of related work should be in a separate chapter and which needs to be needs to be embedded within the relevant chapters. I think the candidate has done an excellent job of splitting the related work well.

Chapter 3 introduces a new pointing technique called CurSAR which is a mouse-cursor based technique for pointing at physical objects. The system projects the cursor from tehe user’s point-of-view in two ways. One is a so-called SAR condition and the other is a SCREEN condition. Through a user-study the candidate compared the two conditions for time, inefficiency, error-rates and throughput. The main conclusion of the user-study seems to be that while the Screen condition was marginally faster, less inefficient in terms of movements. The results are interesting but the description of the interaction techniques and the data-analysis are not sufficiently detailed to get a clear understanding of the techniques. It is difficult to explain in words how the techniques work – it would have been great if there was an accompanying video to go with the chapter.

Chapter 4 presents a system called Tangible Viewports which extends the curSAR technique to create a hybrid workspace. The main idea is that users can have desktop applications open on their screen and use it to edit/ augment physical objects. For example, a painting application could be open on the desktop and the user could move a cursor (using the curSAR technique from Chapter 3) from that desktop application to a paint the physical object that is in the environment next to the user. The Tangible Viewport system then uses a projector-camera system to track and project the right colour on the object to give the impression to the user that they are using the desktop paint application to manipulate the physical object. This is a clever and nifty system. I thought it is a great extension of the curSAR system and is only possible today because of some of the developments in 3D-depth sensing cameras and tracking systems. This chapter demonstrates how simple applications can help users bridge the digital-physical divide. There is a small exploratory study that confirms the authors opinion that this is a useful and interesting tool.

Chapter 5 presents Teegi a tangible object that helps users learn about their brain activities. The user wears an EEG head-set and simple interpretations of thir brain activity are represented in real-time on Teegi. Teegi is an anthropomorphic character on whose head a projector projects visualisations that represent specific brain activity of the person wearing the EEG headset. The type of brain activity presented is selected using a tangible interface and it can be one of 4 activities – Wide-band EEG activity, Sensorimotor activity, Visual activity or Meditation. This chapter has been well thought out and thorough.

Chapter 6 presents a toolkit for creating tangible experiences that use anthropomorphic objects to embody a users physical or mental activity. The goal of this chapter is to give users and designers a toolkit to explore different tangible out-of-body visualizations. The examples presented are interesting but it is not always clear how well the system is designed to support other designers. While it is clear that considerable thought and energy has gone into designing a toolkit, the user study did not specifically explore that aspect of the design. The user-study looked at how users appreciate the designs but not at how the system is able to support designers. It is possible that the word “toolkit” is being used in a different context to the one I imagine. This could be clarified in the defence.

Chapter 7 provides some future work that could be pursued as extensions to the various systems presented in this dissertation. I liked the structure and presentation style of this chapter. Each nugget of idea clearly builds on work that was done by the candidate and is well thought through.

Overall, this is a good dissertation which contributes to our understanding of tangible user interfaces and how physical artefacts can be used to support our digital interaction. The thesis goes beyond creating interaction techniques but provides an eco-system of systems that can be used to support low-level interaction along with introspection. There is no doubt in my mind that there is more-than sufficient work for the candidate to be awarded a PhD.

A retourner à la DiRVED *To be returned to:*

DiRVED - Bât A33 - Bureau 115 - 351 cours de la libération - 33405 Talence cedex

ou par mail à la gestionnaire en charge du dossier

*or by email to the administrative manager in charge.*