VINCI: VIsualizatioN for CreatIvity in collaborative technological spaces

Context

The Ph.D. will start between October and December 2024. This Ph.D. project is a collaboration between CESI LINEACT (Nanterre) and LTCI, Télécom Paris (Palaiseau), and is part of the PEPR eNSEMBLE on the future of collaboration (http://pepr-ensemble.fr/home.html). The selected candidate will be interviewed by the executive board of the eNSEMBLE project, and the final decision will be made in early June 2024.

Thesis supervisors:

- Stéphanie Buisine, Beatrice Biancardi, CESI LINEACT
- James Eagan, DIVA team, LTCI, Télécom Paris

Description

An increasing variety of interactive tools, characterized by different degrees of physical presence, immersion and temporal synchrony, is being developed for group collaboration. Insufficient attention has been given to the collective phenomena occurring when individuals interact with each other using digital technologies (Handke et al., 2021). Insights on these aspects are needed to guide the design of new digital collaboration spaces. In particular, it is crucial to better understand how these new interactions affect group dynamics and, in turn, group performance compared to more traditional interactions.

In multi-surface interaction contexts, which make available several interactive devices, each with different interaction, computational, and rendering capabilities, the dynamics between users and technology may evolve. For example, users may adapt their analyses or methods depending on the union between their own needs and the available technologies (Liu et al, 2021).

These challenges are especially crucial in creative application contexts. Creativity is indeed a high-level cognitive process that carries with it paradoxical issues, since it corresponds to the ability to produce something that is both *original and appropriate* (Lubart, 1994). Originality requires a divergent associative process, whereas appropriateness requires a convergent evaluative process. When creativity is practised in a group, the antagonism between these two components (divergence and convergence) is even more apparent, as group members can interfere with each other if they are not synchronised on the phase of the creative process. To be effective, collective creativity must therefore be doubly equipped: from a creative point of view (inspiration, cognitive stimulation, participation, visualisation) and from a social point of view (interaction, coordination, capitalisation, leadership). Our previous work focused on highlighting the impact of collaborative technologies (multi-user, multimodal, immersive, presence, remote, even asynchronous) on group creativity (see Buisine et al., 2017).

Faced with these challenges, this project aims to foster group creativity through the appropriation of collaborative visualisation devices. Through an interdisciplinary approach, merging cognitive sciences, social signal processing and computer science, it will make a double contribution at both methodological and technological levels. As creativity is one of the key soft skills of the 21st century, the expected results of this project can be applied to several contexts, from education to industry, and in particular in the field of innovation.

In particular, we are interested in the following research questions:

RQ1: What collective socio-cognitive processes impact the creativity process?

Determine the underlying conceptual model among those already identified in the literature. In particular, we may rely on the Component Theory of Creativity (Amabile, 2013) or Lubart's multivariate approach (Lubart & Guignard, 2004). Result: state of the art on existing models to select one.

RQ2: How to design an interactive collaborative visualisation space facilitating group creativity?

- **RQ2a**: What (verbal and non-verbal) behaviours between group members and tools (physical and/or digital) characterise the selected model (RQ1)?
- **RQ2b**: How to facilitate and fluidify the transitions of dynamics during the evolution of the technologies available in an interaction (e.g. availability of an interactive wall), taking into account the spontaneous needs in the process of creativity?

- **RQ2c**: How can we take advantage of having several representations that are more or less appropriate to the context (e.g. tablet with stylus vs. mouse-keyboard for drawing)?

As creativity is one of the key soft skills of the 21st century, the results expected from this project can be applied in a number of contexts, from education to industry, and particularly in the field of innovation.

Project organization, duration, milestones

The scientific state of the art in the fields of digital tools for collaboration, creativity and group emergent states will be the entry point for the project, and the literature review will continue throughout the duration of the thesis. Three major studies will structure the scientific contributions of the project:

- A qualitative study (in the form of interviews and/or focus groups) among creativity experts to complement the state of the art in response to RQ1;
- The design of experimental protocols to address RQ2a;
- The implementation and evaluation of a collaborative tool to respond to RQ2b and RQ2c.

Depending on the PhD student's profile, one or two M2 interns will be involved in the development or experimental protocol part of the project. These studies will be promoted in the form of publications (ongoing activity from the end of the first year of the thesis).

	1st Year		2nd Year		3rd Year	
Literature Review						
Study 1						
Study 2						
Study 3						
M2 Internship						
Publications						
Thesis Writing						

Profile

We look for interdisciplinary profiles across Human-Computer Interaction, Ergonomics and Cognitive Science domains.

Basic knowledge on web programming is required (notions of JavaScript, DOM).

Application

Please send a single PDF file, including:

- CV
- Master's transcripts
- Motivation letter
- Contact of one or two references

before May 3rd, to sbuisine@cesi.fr, bbiancardi@cesi.fr, james.eagan@telecom-paris.fr

Subject of the e-mail: [Application for VINCI Project 2024].

Interviews with selected candidates will be organized on May 7th.

Do not hesitate to contact us if you have any questions.

References

Amabile, T. (2013). Componential theory of creativity. In: E.H. Kessler (Ed.), Encyclopedia of Management Theory, pp. 538-559. Boston, MA: Harvard Business School.

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