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# Tangible Interactions for Railway Management in Control Centres

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# Tangible Interactions for Railway Management in Control Centres

## ACTUATED TANGIBLE INTERACTIONS

**Tangible interfaces:** human-machine interfaces in which users interact through objects or human physical movements<sup>1</sup>. They can help for collaboration<sup>2</sup>.

**Actuated tangible tokens** are tokens that can move by themselves or be moved by user. They are used for planning management<sup>3</sup> or remote collaboration<sup>4</sup>.

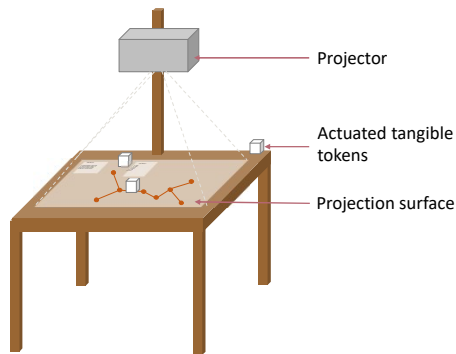
## CONTROL CENTRES (in French industry)



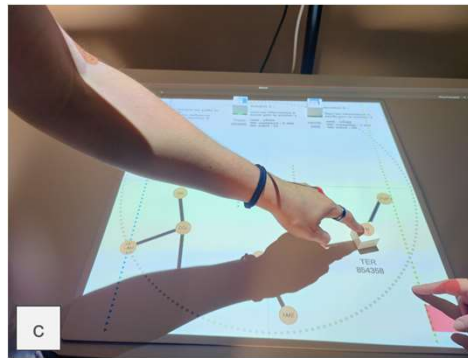
In **control centres**, operators manage real time traffic and resolve disruptions.

Our **observations** suggest that operators faced challenges regarding information sharing, and decision-making, especially during incidents. In addition, **real-time optimization algorithms** will change operators gestures.

## PROTOTYPING TANGIBLE INTERACTIONS FOR DECISION-MAKING IN CONTROL CENTRES



Schema of the setup of the prototype



Scan me !

To access to details and video of the interactions.

We **designed a prototype** with an actuated tangible tokens on a shared display to assist operators when solving a crisis situation.

We **created a incident scenario** with a train stopped on the rail, operators have to rescue it.

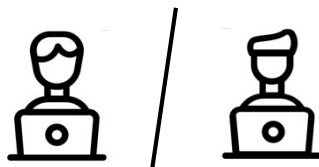
We **performed expert feedback sessions** with 34 operators et 3 incident resolution experts.

Our **results** suggest that this display could help operators during crises with information sharing, context understanding and time-saving.

## ACTUATED TANGIBLE TOKENS AS OUTPUT FOR COLLABORATION (future work)

**Our hypothesis :** actuated tangible tokens for feedback could be better to see what others are doing or to see a notification.

**Experiment :** compare actuated tangible tokens and visual-only projection during a remote collaboration task. The task and measures have yet to be defined.



	Case 1	Case 2
Task	Remote collaboration task	
Input	Tangible tokens	
Output	Actuated tangible tokens	Visual-only projection
Communication	Verbal communication	

## CONCLUSION

- Tangible interactions have not been studied in incident management situations for railway traffic.
- Our first prototype is promising for the future.
- Next experiment will compare actuated tangible tokens and visual-only projection for a remote collaboration task.

[1] Brygg Ullmer and Hiroshi Ishii. 2000. Emerging frameworks for tangible user interfaces. IBM systems journal 39, 3.4 (2000).

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[3] Sebastian Doeweling, Tarik Tahiri, Philipp Sowinski, Benedikt Schmidt, and Mohammadreza Khalilbeigi. 2013. Support for collaborative situation analysis and planning in crisis management teams using interactive tabletops. In Proceedings of the 2013 ACM international conference on Interactive tabletops and surfaces.

[4] Jan Richter, Bruce H Thomas, Maki Sugimoto, and Masahiko Inami. 2007. Remote active tangible interactions. In Proceedings of the 1st international conference on Tangible and embedded interaction.