# Territoriality in DUI: examples with games

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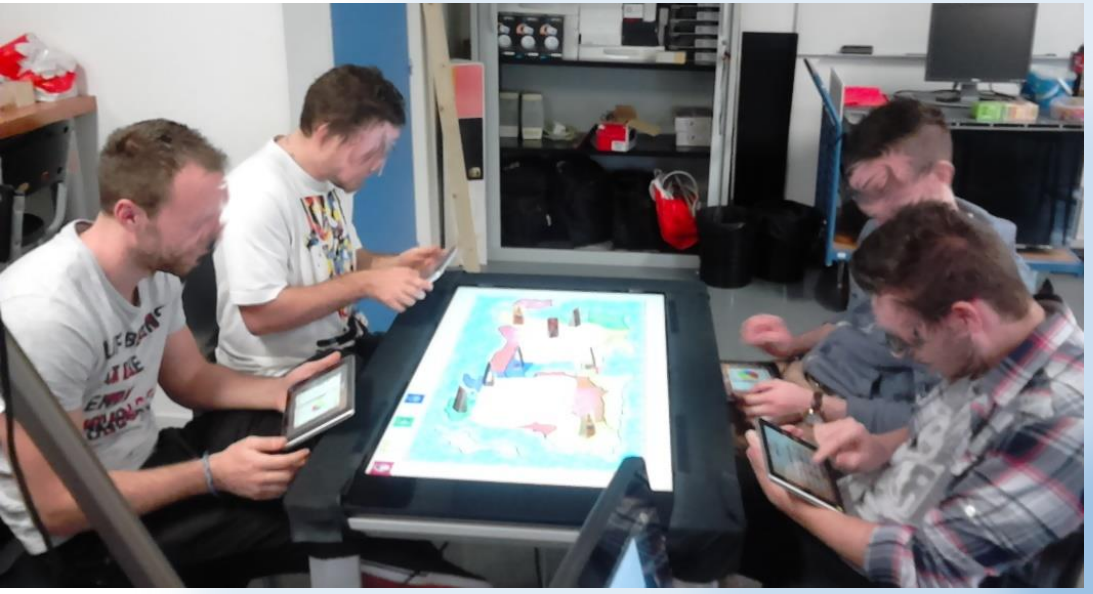
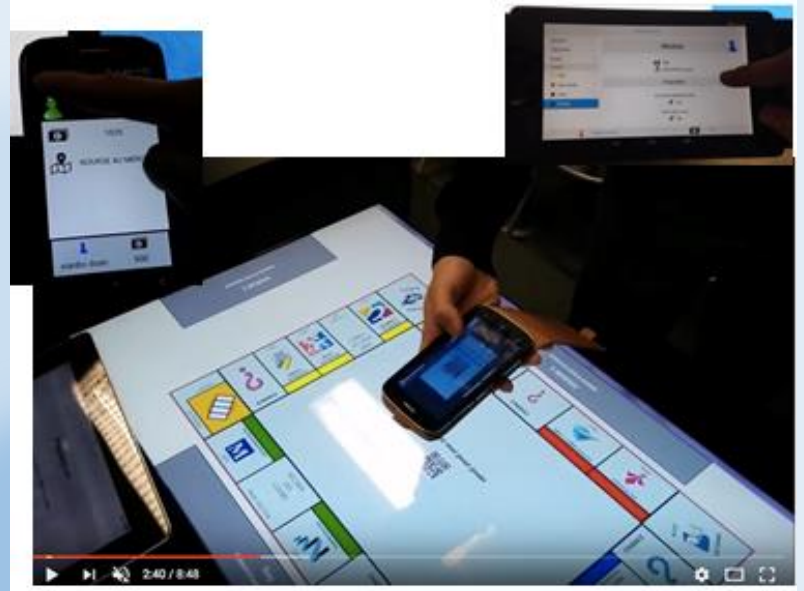
Workshop Entrain,
Exploring New Territorial User Interfaces : November Session

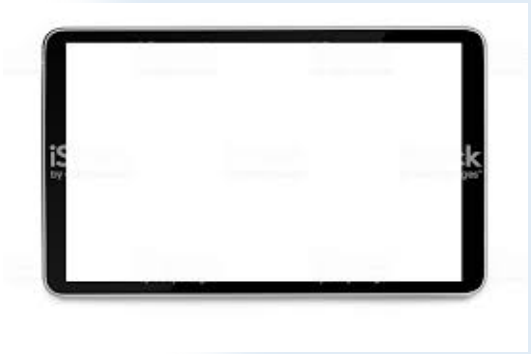
# Context: Distributed HCI

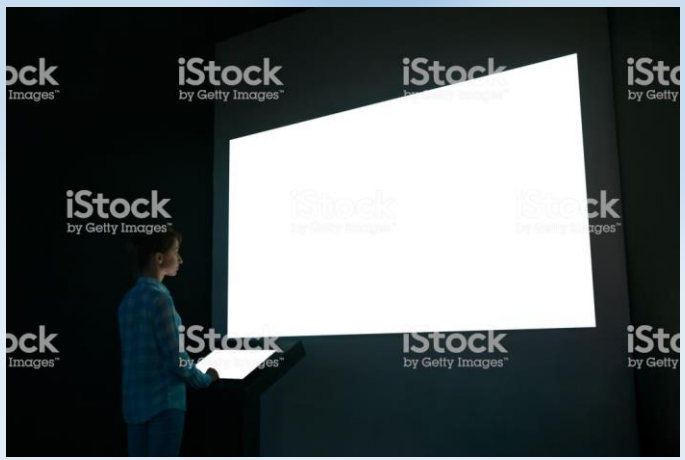




# Problem (1): diversity and specificity of devices



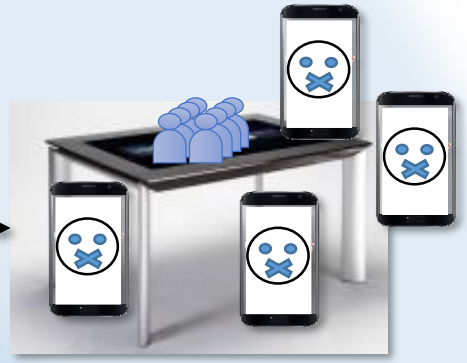




# Problem (2): which UI distribution ?

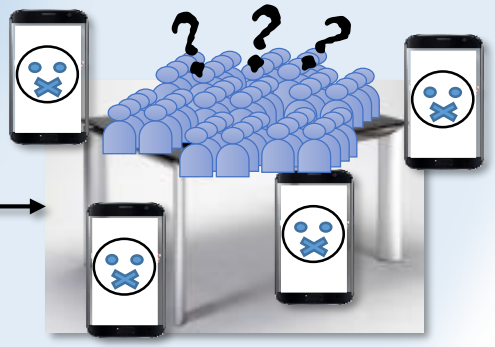

?

Some trivial cases



**But...** what if there are too many transitions between devices?

**But...** what if there's too much public information?



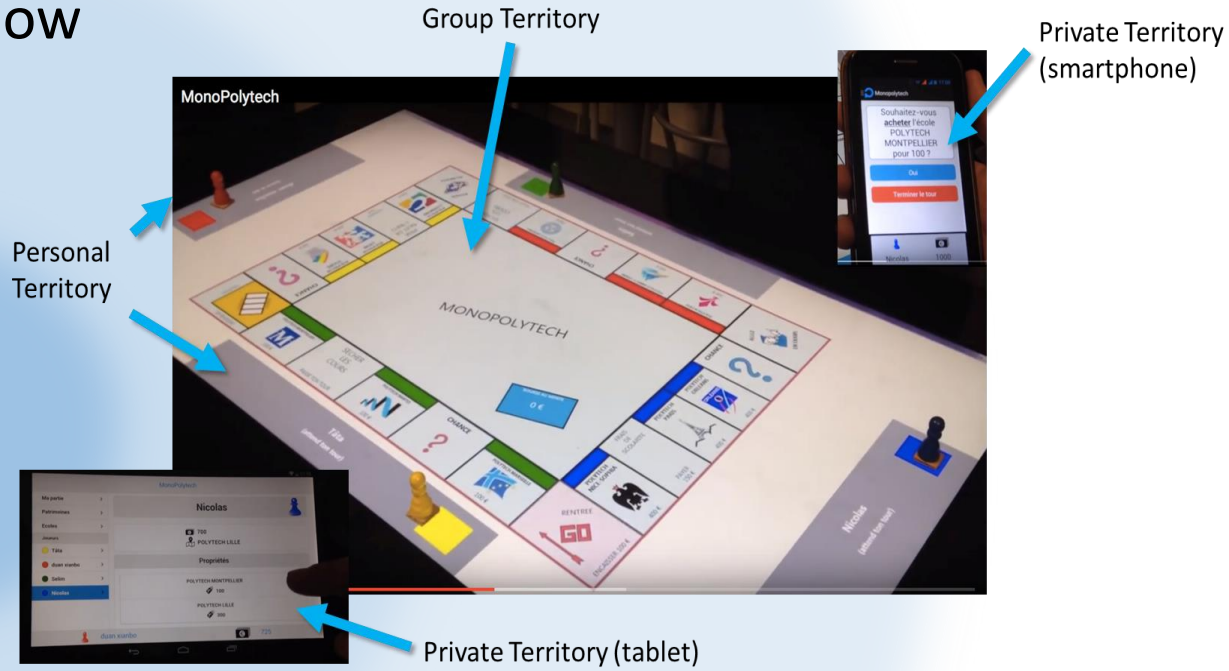
but... but... but... but...

# Goal: Distribution on Tasks on Territories and Devices

- Starting with task model and knowing devices (and f-formation)
- Avoiding
  - Cognitive and display overload
  - Frequent device changes to avoid burdening the interaction
- According to the data types

# Theoretical Background

- Task Model
- 5W1H: Who, Why, Where, When, What, How
- **Territoriality**




Data can be

- visible and manipulable by only one player (VMbO - private data),
- visible and manipulable by all (VMbA – a kind of public data),
- visible by all but manipulable by only one (VbAMbO – another kind of public data).


- Jiannan Li, Saul Greenberg and Ehud Sharlin. 2017.A two-sided collaborative transparent display supporting workspace awareness, International Journal of Human-Computer Studies, vol. 101, pp. 23-44, Elsevier (2017) https://doi.org/10.1016/j.ijhcs.2017.01.003
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- Philip Tuddenham and Peter Robinson. 2009. Territorial coordination and workspace awareness in remote tabletop collaboration. In Proceedings of the 27th International Conference on Human Factors in Computing Systems, CHI 2009, Boston, MA, USA, April 4-9, 2009, Dan R. Olsen Jr., Richard B. Arthur, Ken Hinckley, Meredith Ringel Mor- ris, Scott E. Hudson, and Saul Greenberg (Eds.). ACM, 2139–2148.
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# Studying BoardGames

| Game | Year | Category | Context of use | Result |
|---|---|---|---|---|
| Conquistador Island | 2013 | BoardGame | 4 players / 1 tabletop / 4 mobile devices | Used during the school open day |
| Monopolytech | 2013 | BoardGame | 4 players / 1 tabletop / 4 mobile devices | Used during the school open day |
| Cluedo | 2014 | BoardGame | 4 players / 1 tabletop / 4 mobile devices | Used during the school open day |
| Polydefense | 2016 | BoardGame | 4 players / 1 tabletop / 4 mobile devices | Used for tests |
| 7 Wonders | 2019 | BoardGame | 4 players / 1 tabletop / 4 mobile devices | Used for tests |
| Footsurtable | 2019 | BoardGame | 4 players / 1 tabletop / 4 tablets | none |
| BetConqueror | 2020 | BoardGame | 4 players / 1 tabletop / 4 mobile devices | Used for tests |
| Milles Bornes | 2020 | Card game | 4 players / 1 tabletop / 4 mobile devices | Designed only |

# Example: Conquistador Island

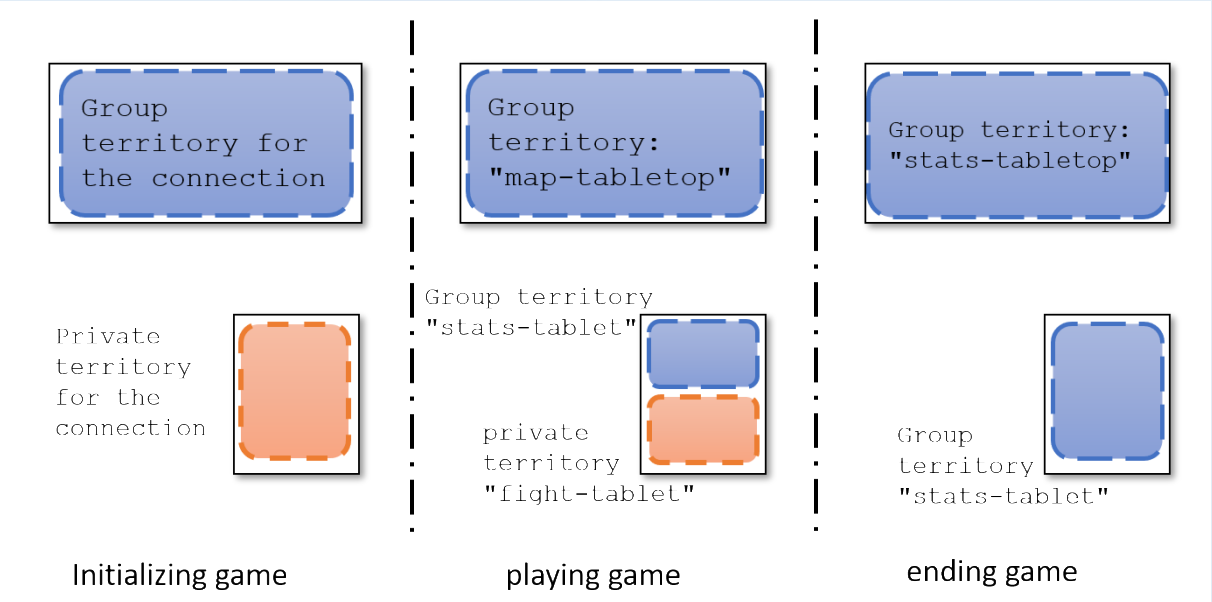

- Inspired by the game “Conquistador” published in 2001 and the game “Trivial pursuit” published in 1981
- based on an island map composed of 16 lands
- 4 players (plus a game master played by the system).
- Objective: to conquer and manage a maximum of lands
- Players can conquer new lands and attack the lands of another conquistador (by moving tokens).
- Fighting: general culture questions that need to be answered as quickly as possible.
- **All the players have the same role**

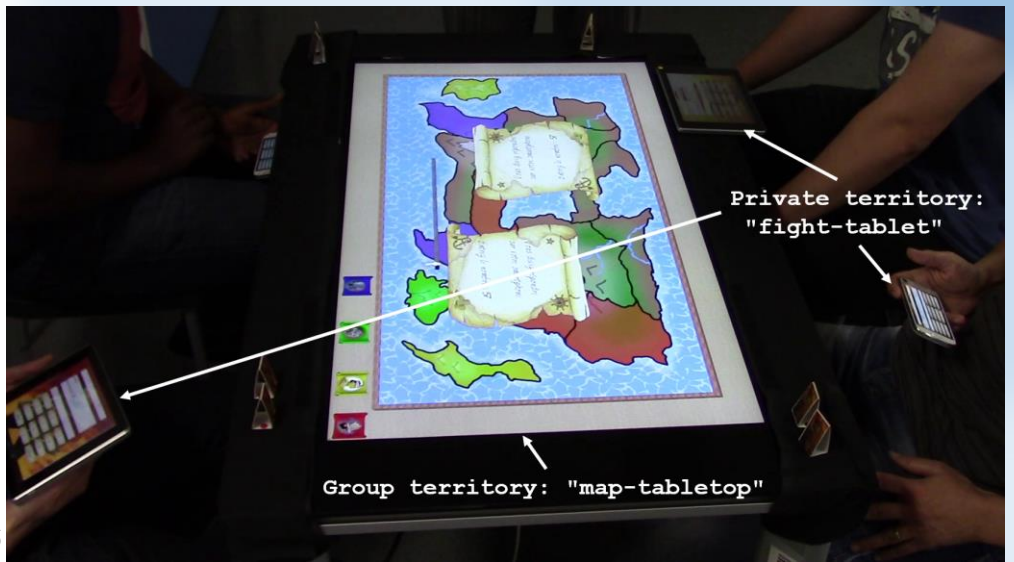
Only one static formation during the game

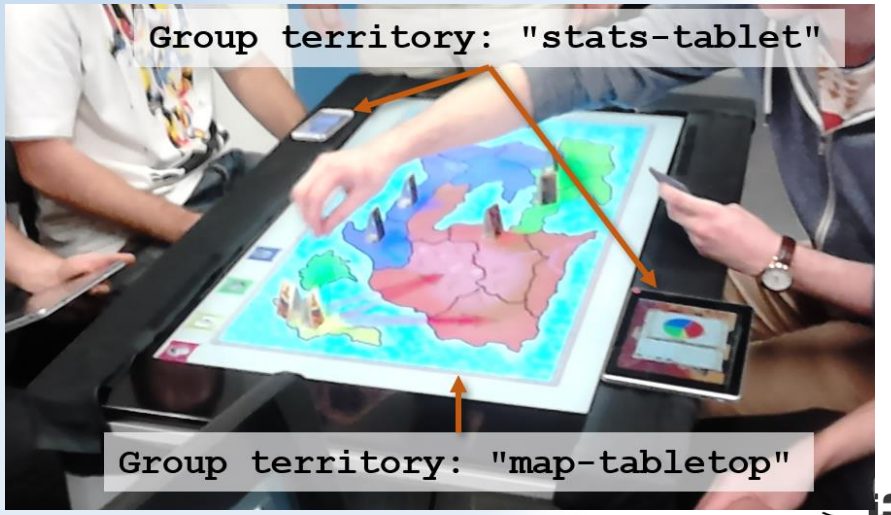
# Distribution of HCI on Territories and devices for Conquistador Island

Evolution of territories during the game to avoid

1. cognitive overload
2. frequent device changes to avoid burdening the interaction..



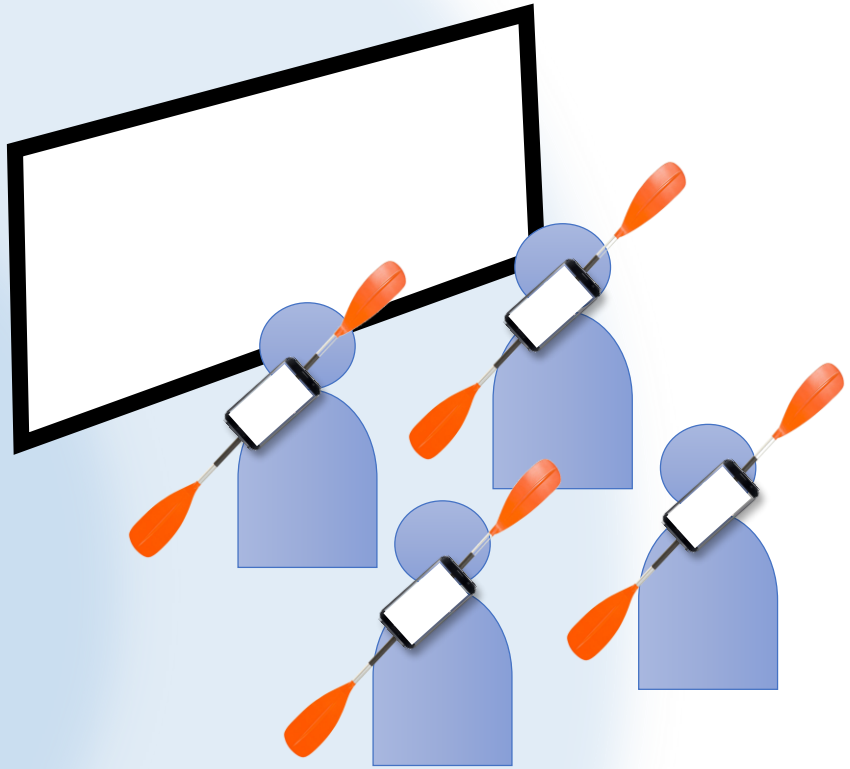



# Studying Simulation Games

| Game | Year | Category | Context of use | Result |
|---|---|---|---|---|
| Course de Haies | 2019 | Simulation Game | 2 players / 1 wall / 2 connected watches / 1 tactile terminal | Used during the museum open day |
| Kayak | 2019 | Simulation Game | 2 or 4 players / 1 wall / 2 or 4 mobile phones / 1 tactile terminal | Used during the museum open day |
| TirsAuBut | 2019 | Simulation Game | 4 players / 1 Wall/ 1 Wii / 1 mobile phone | Used for tests |

# Example: Kayak Racer

- A paddle with a smartphone per player
- 2 kayak / 2 teams
- 4 fixed places for 4 players in front of a public display of the race

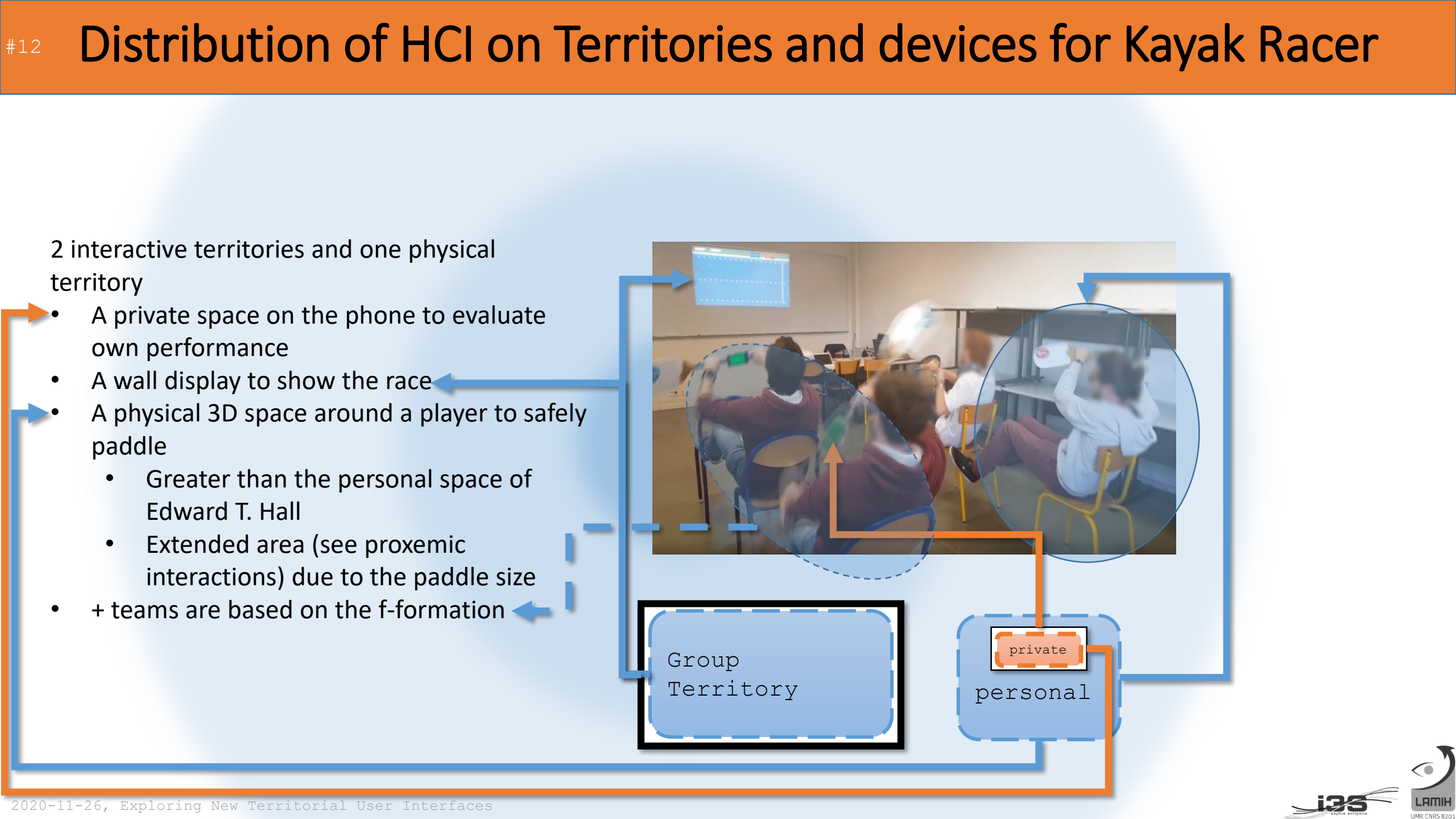
Only one static formation during the game

# Distribution of HCI on Territories and devices for Kayak Racer

2 interactive territories and one physical territory

- A private space on the phone to evaluate own performance
- A wall display to show the race
- A physical 3D space around a player to safely paddle
  - Greater than the personal space of Edward T. Hall
  - Extended area (see proxemic interactions) due to the paddle size
- + teams are based on the f-formation





# Studying Serious Games

| Game | Year | Category | Context of use | Result |
|---|---|---|---|---|
| PolyEscapeVR College | 2018 | Serious game for education | 1 game master, n players / 1 desktop computer and n VR headsets | Used for tests |
| PolyEscape | 2018 | Serious game for education | 1 game master, n players / 1 desktop computer and n tablets | Used for tests |
| PolyErgo | 2017 | Serious game for health | 1 occupational therapist, n patients / n tabletop and 1 tablet | Used for tests |
| Classification Alzheimer | 2020 | Serious game for health | 1 occupational therapist, 2 patients / 1 tablet and 1 tabletop | Used in a medical institute |
| TOT | 2020 | Serious game for health | 1 occupational therapist (mobile device) / 2 patients (tabletop) | Used in a medical institute |

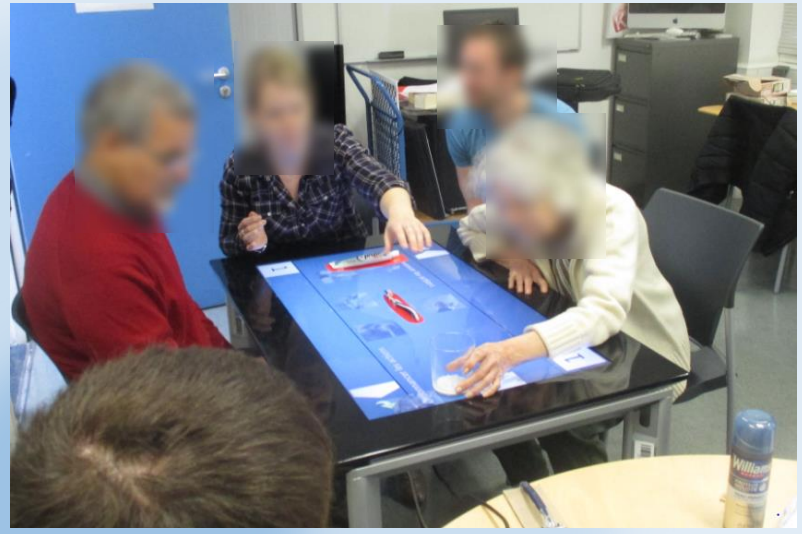
# Example: recognition of objects for brushing teeth (Alzheimer day care) (1/2)

# Example: recognition of objects for brushing teeth (Alzheimer day care) (2/2)

2 Alzheimer's patients (people welcomed for the day), face to face to preserve intimate space

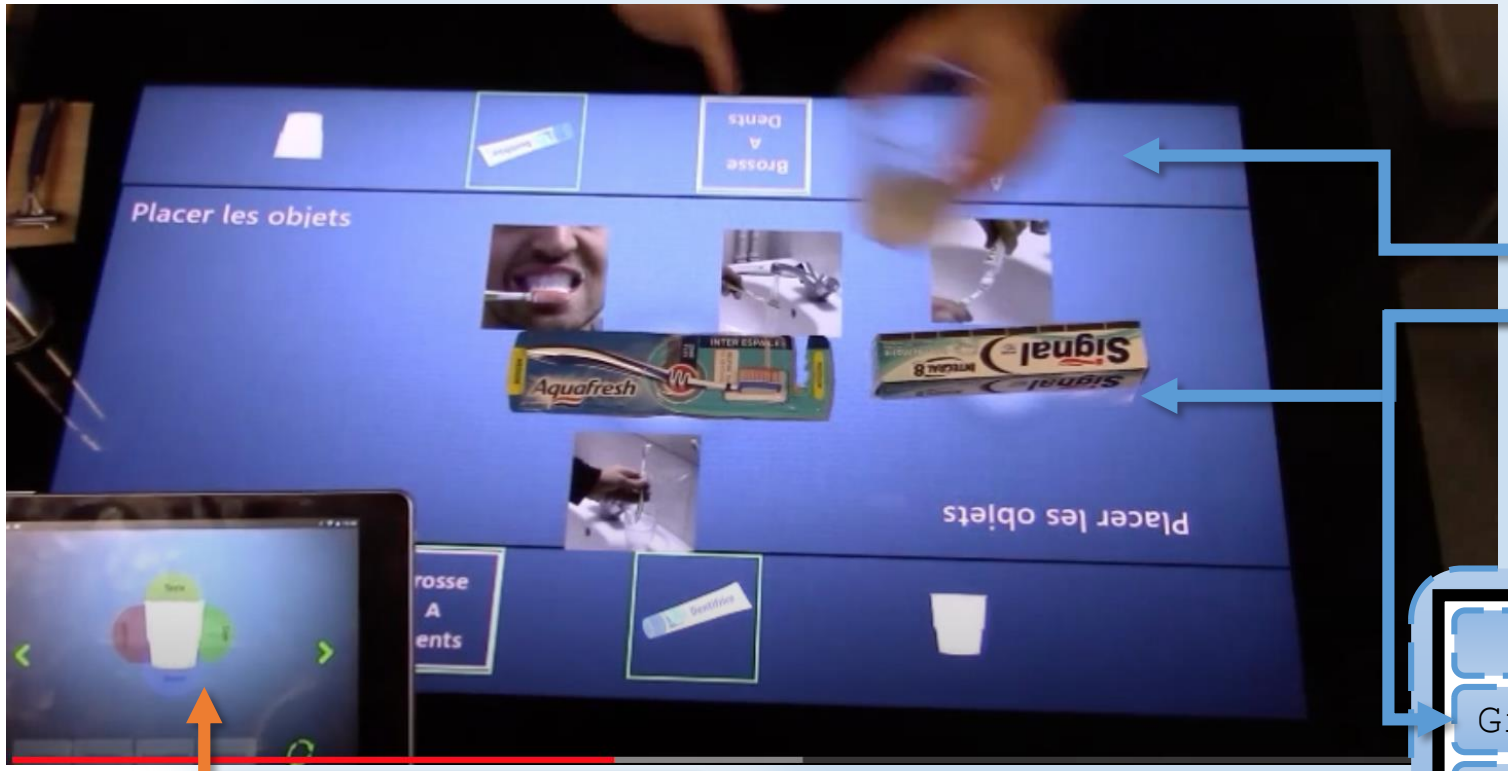
1 facilitator (psychomotor therapist or neuropsychologist) at the center can come near to a user and enter their personal and intimate spaces (trust)

The tablet is not always used - only to change the configuration



2 formations : the facilitator on the side or the facilitator closely helping a patient

# Distribution of HCI on Territories and devices for recognition of objects for brushing teeth (Alzheimer day care)




- 1 interactive table (Alzheimer's patients) :
  - 2 personal territories face to face in the center 1 Group territory
  - 1 storage territory (border of the tabletop)

1 tablet (facilitator): 1 private territory to configure

# Reflection on the positioning of users (1/2)

Position defined beforehand
static and taken into account in the realization of DUI

**Case 1: board game**
Preserve similarity with existing games

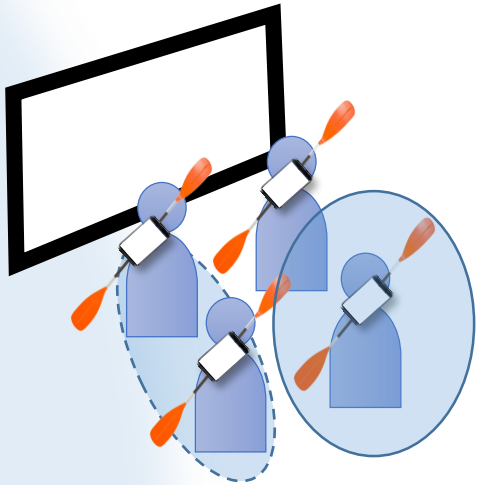
1. Play seated for games that last a long time

2. Keep a certain distance between the players to avoid cheating
   impact in the positioning of the private territory (Conquistador Island)
   user moves (without changing place) to get distant token

3. Allow movement using the mobile device to perform certain actions
   the players move around the table to place their pawn (turn-by-turn game)

# Reflection on the positioning of users (2/2)

**Case 2: Simulation games in an open museum environment**



1. Distance between the players and the central device
   requires marking on the ground (jump over hurdles)
   or positioning of chairs (Kayak)

**2. Study of the arrival of a player during the simulation to do**

Case 3: Serious games

1. Positions defined beforehand to preserve the intimate space

2. Displacement of the facilitator to help an Alzheimer's patients
   no time constraint

# Thank you!

Any Questions?

# Design Process : Identification step

| Règles | |
|---|---|
| IR1 | Annotating all tasks with the nature of the data handled. That nature of data can be visible and manipulable by only one player (VMbO - private data), visible and manipulable by all (VMbA - a rst kind of public data), visible by all but manipulable by only one (VbAMbO - a second kind of public data). |
| IR2 | Annotating data (text) input tasks (like typing text) |
| IR3 | Annotating major tasks, i.e., belonging to the minimal set of mandatory tasks to play |
| IR4 | Assigning to all devices the list of possible type of territory |
| IR5 | For each territory type, sorting by priority all possible devices |

# Design Process : Distribution step

| Règles | |
|---|---|
| DR1 | For each task assignment to a device, determining whether it is within an existing suitable territory or whether to create a new one |
| DR2 | Assigning data (text) input tasks to a private territory |
| DR3 | Assigning tasks handling private data to the pre- ferred device for private territories |
| DR4 | Assigning tasks handling public data to the pre- ferred device for public territories |
| DR5 | Assigning unassigned tasks to devices according to the assignment of the previous or the next task |

# Design Process : Balancing and transition rules

| Règles | |
|---|---|
| BR1 | If assigning certain tasks to the central device changes the gameplay, then those tasks can be moved to the personal devices |
| BR2 | If the public interactive device is overloaded, major tasks (see IR3) should be given priority |
| TR1 | If there is a device change between two consecu- tive tasks, then one of these task may be replicated on the other device |
| TR2 | If there is a device change between two consec- utive tasks, then a reinforcement feedback may be added |
| TR3 | If there is a change of devices for two (frequent) consecutive tasks, then it is possible to move one of the two tasks from one device to another |