
Visualization of user behavior in usability studies

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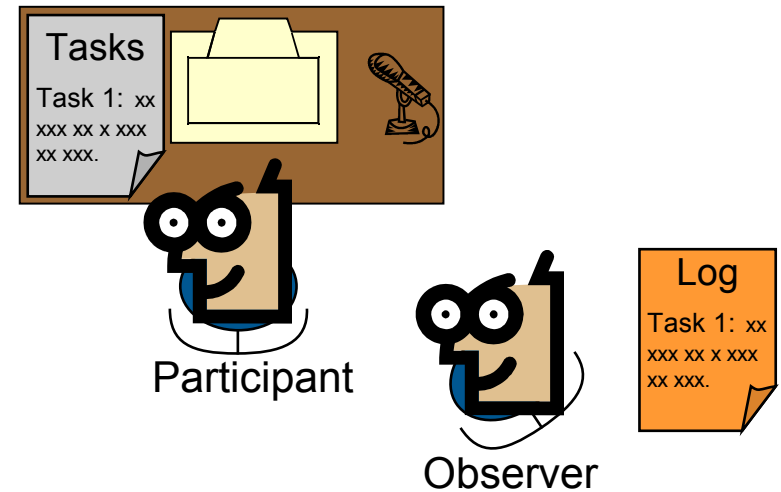


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Usability testing

- Observation of participant
- While performing tasks
- Taking notes – log
- Data analysis
- Final report and recommendations

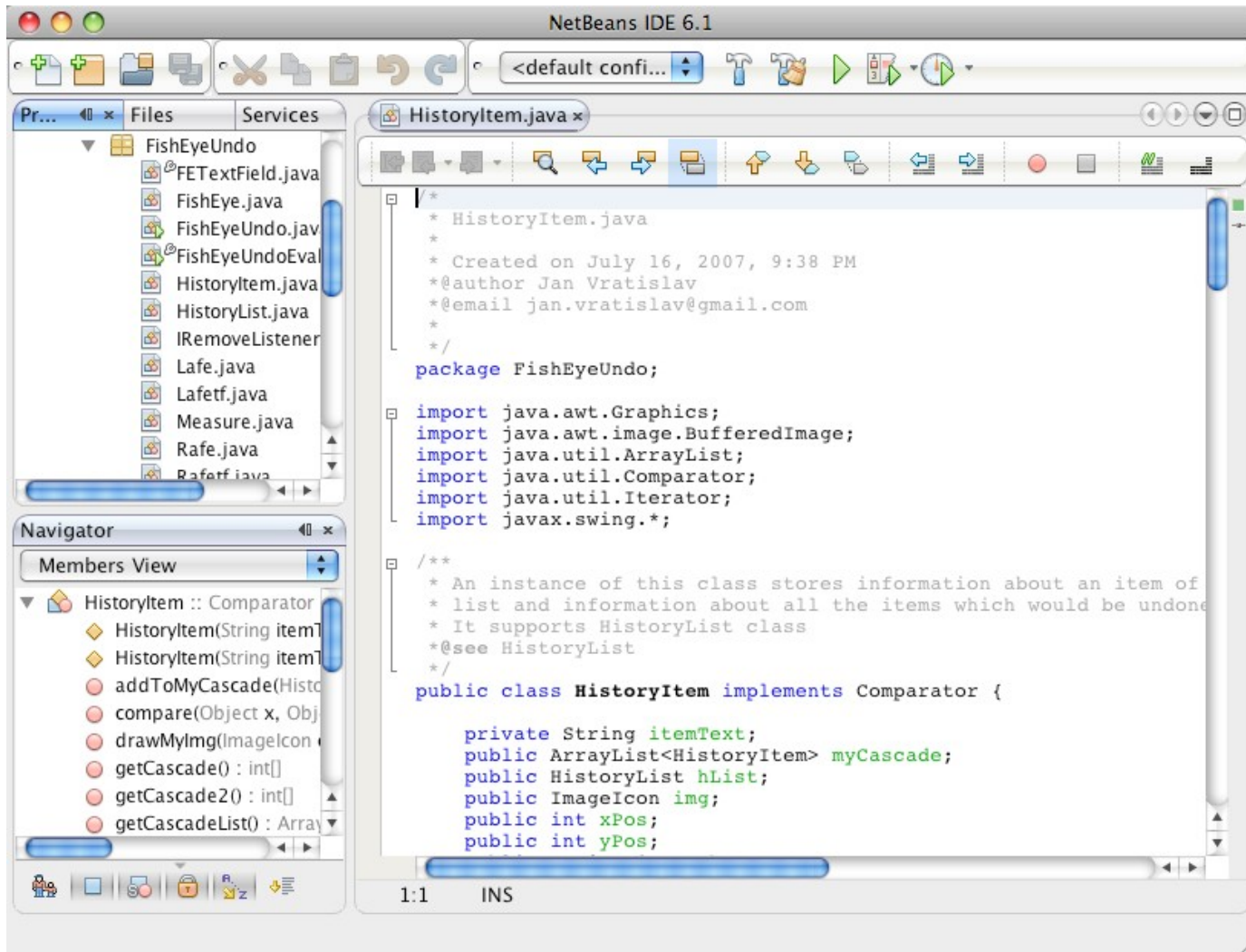


Introduction cont.

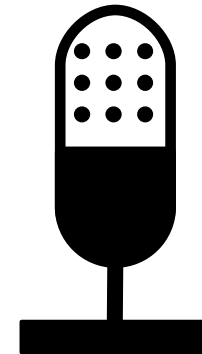
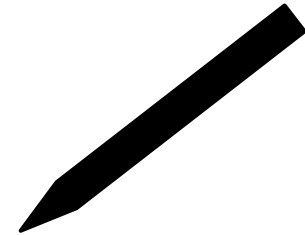
- Is this the one and only setup for usability testing?
- No. There are others.
 - e.g. Remote usability testing
- What about the testing of e.g. mobile applications?



Desktop application



Mobile multimodal application



Comparison

Desktop application

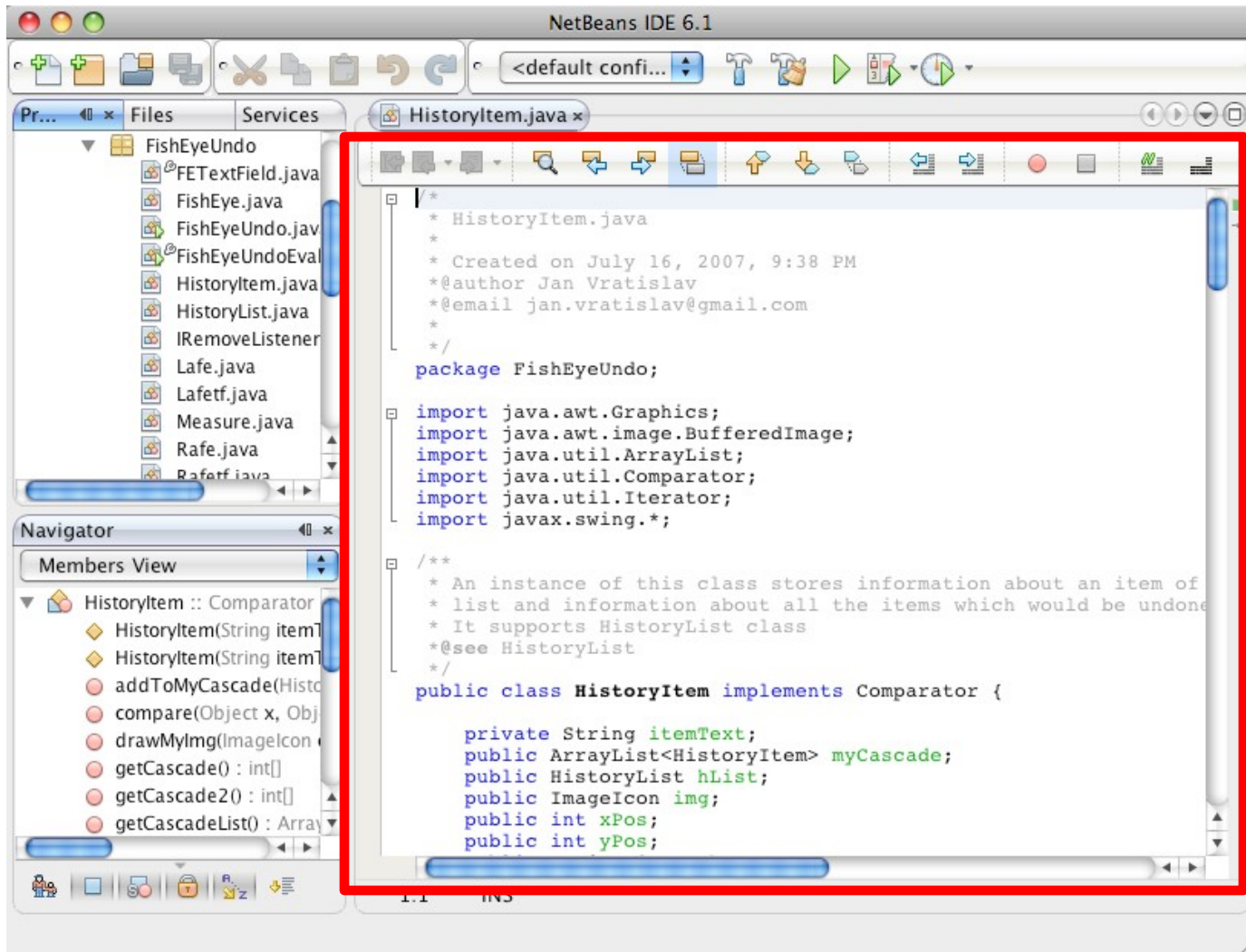
Interaction with
application

Mobile multimodal application

Interaction with
application



Interaction with desktop application



Interaction with mobile application



Comparison

Desktop application

Interaction with
application

?

Mobile multimodal application

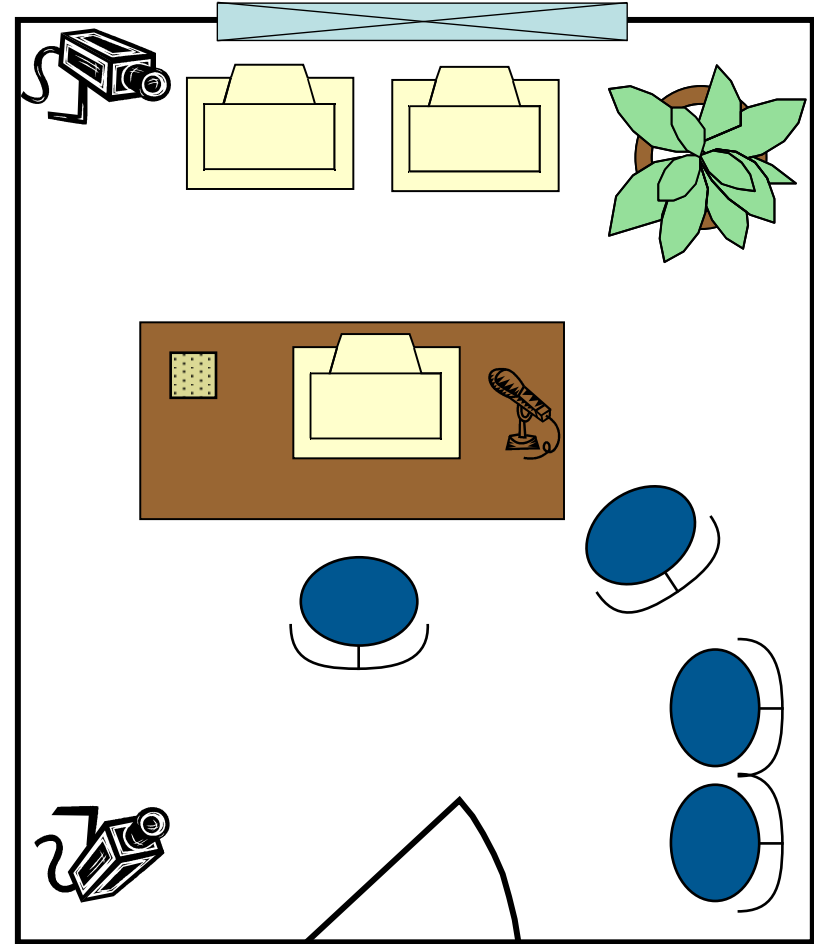
Interaction with
application

User interaction with
neighborhood



Usability testing

- User behavior
 - Looking around
- Interaction with objects
 - Reading barcodes
- Interaction with app.
 - Taking notes
- Interaction with objects
 - Having a rest



Comparison

Desktop application

Interaction with
application

?

?

Mobile multimodal application

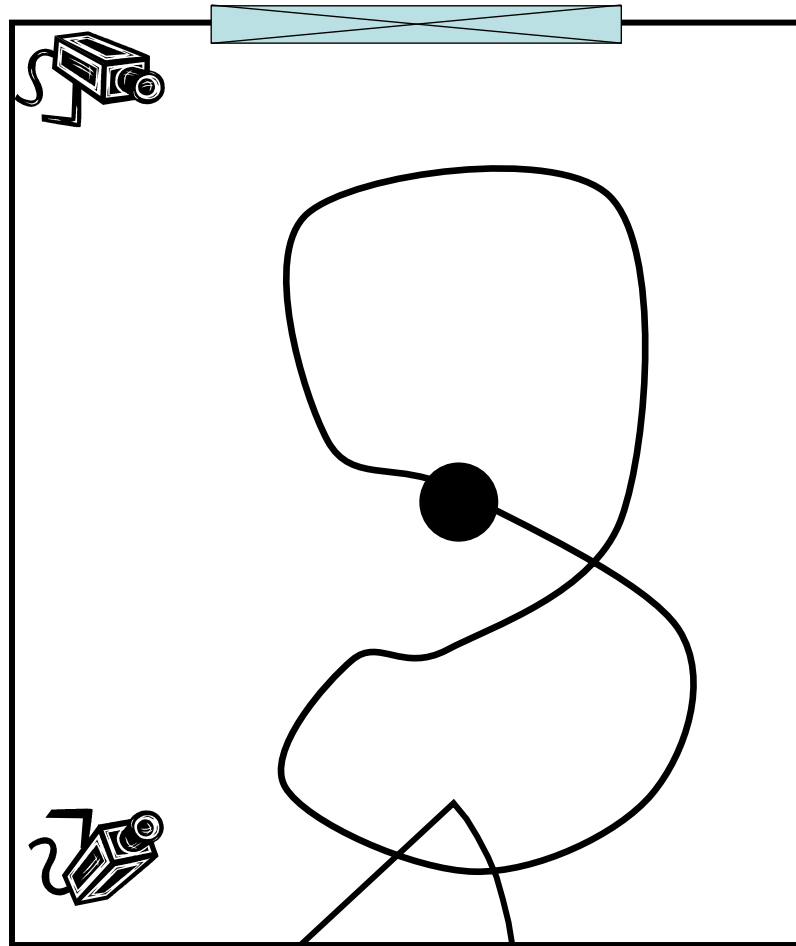
Interaction with
application

User interaction with
neighborhood

User motion
behavior



User motion behavior



Model of user behavior evaluation

Desktop application

Interaction with
application

?

?

Mobile multimodal application

Interaction with
application

User interaction with
neighborhood

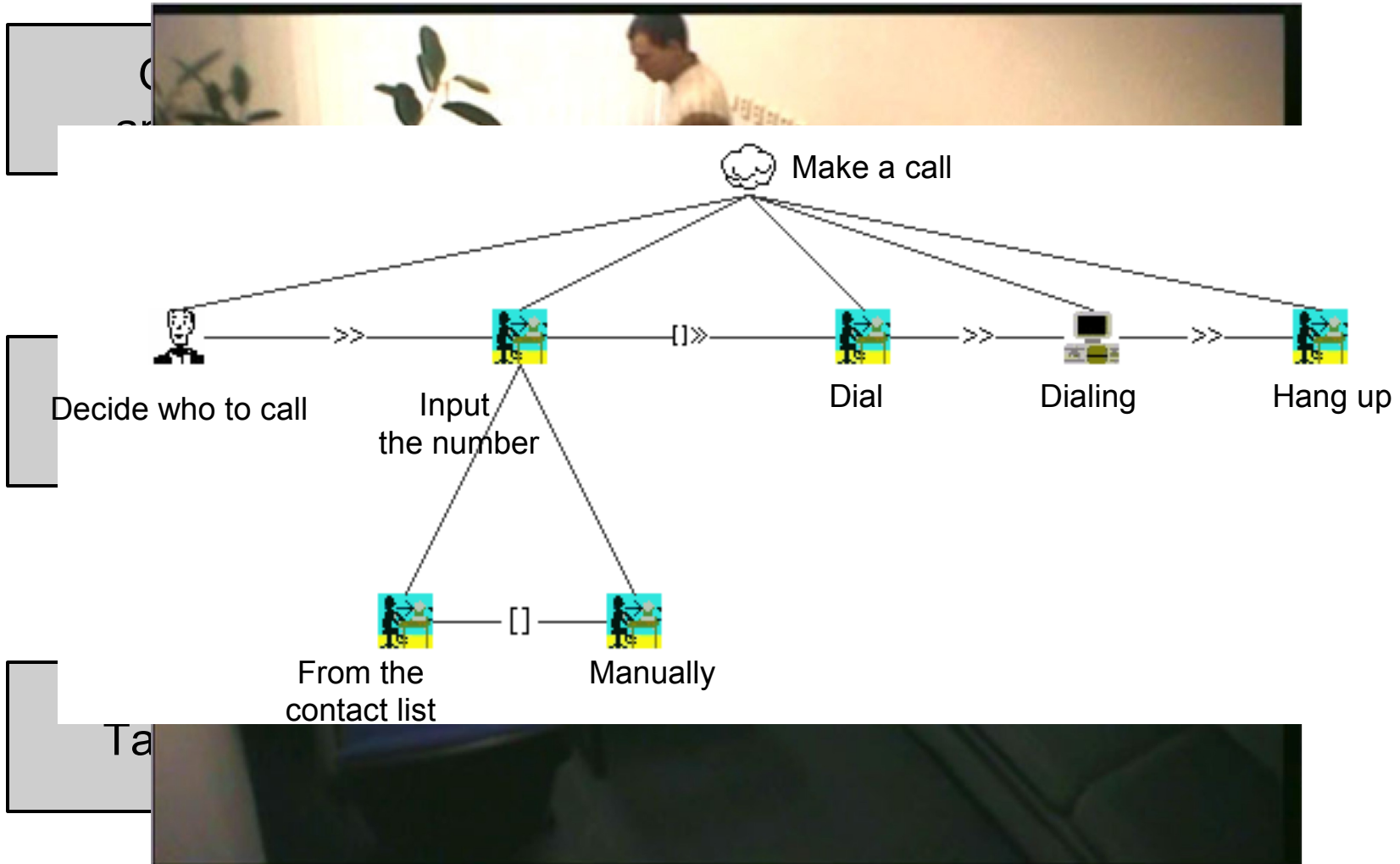
User motion
behavior

High

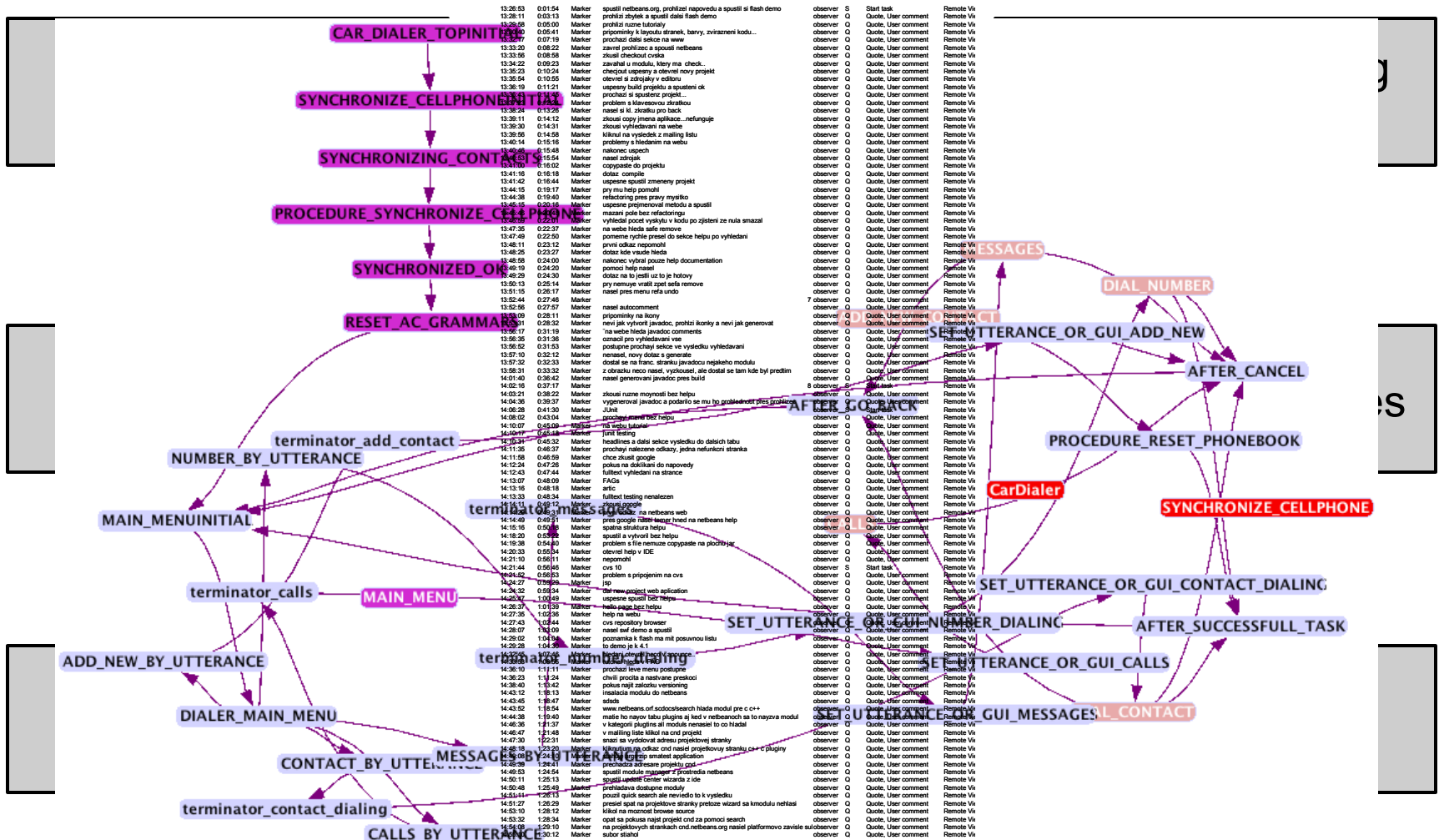
Level of detail

Low

Data sources for usability evaluation



Data sources for usability evaluation

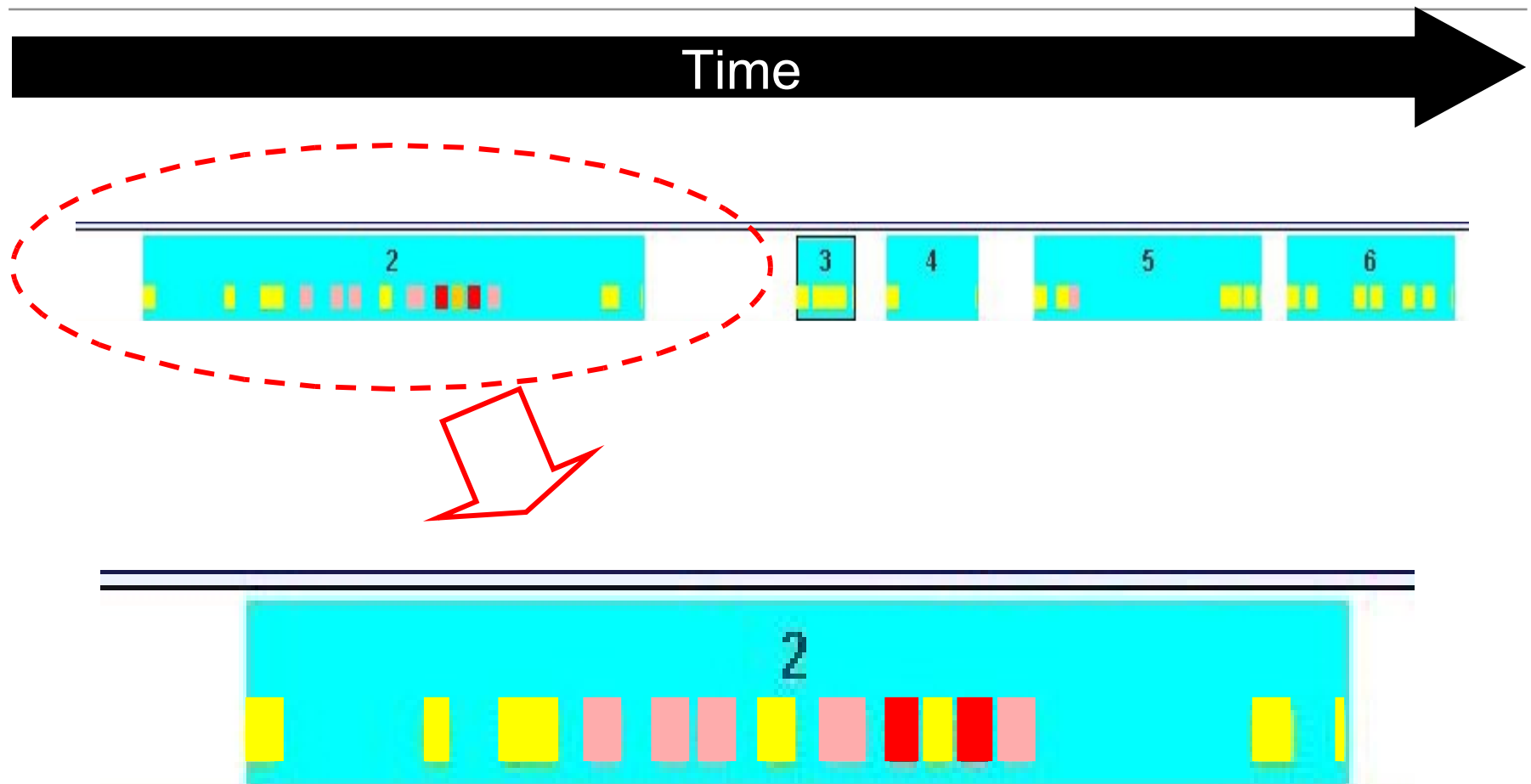


Current state of the research

- **Problems currently being solved:**
 - analysis of big amount of data not usable for direct usage
 - hard to understand
 - protected (ethical issues)
 - not all data sources always available
 - misinterpretation of results
 - missing data sources interconnection
- **Solution is interactive visualization:**
 - Timelines
 - Graphs
 - 3D visualization of the scene (VR)
 - 2D visualization of user motion



Timelines

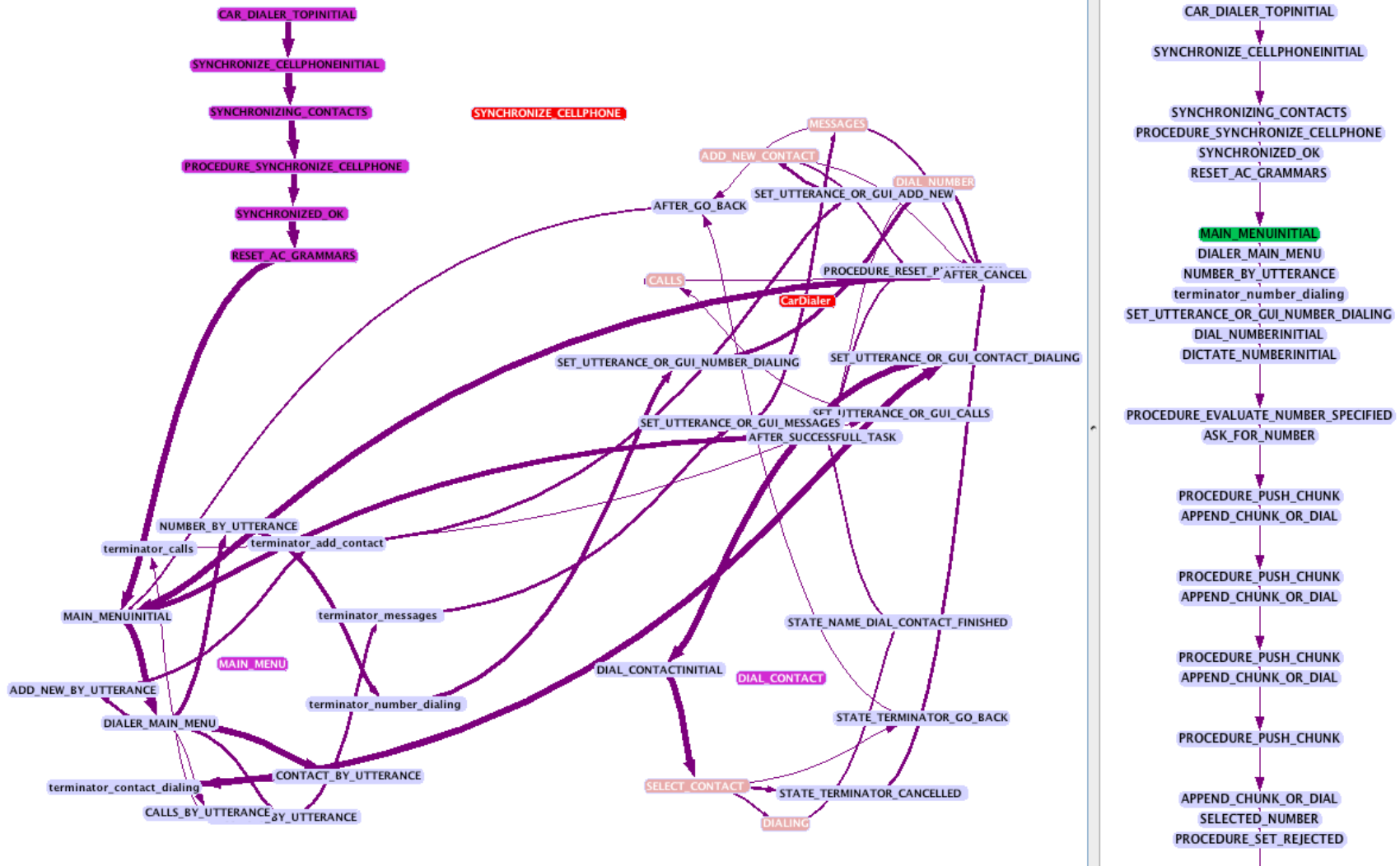


Timelines – cont.

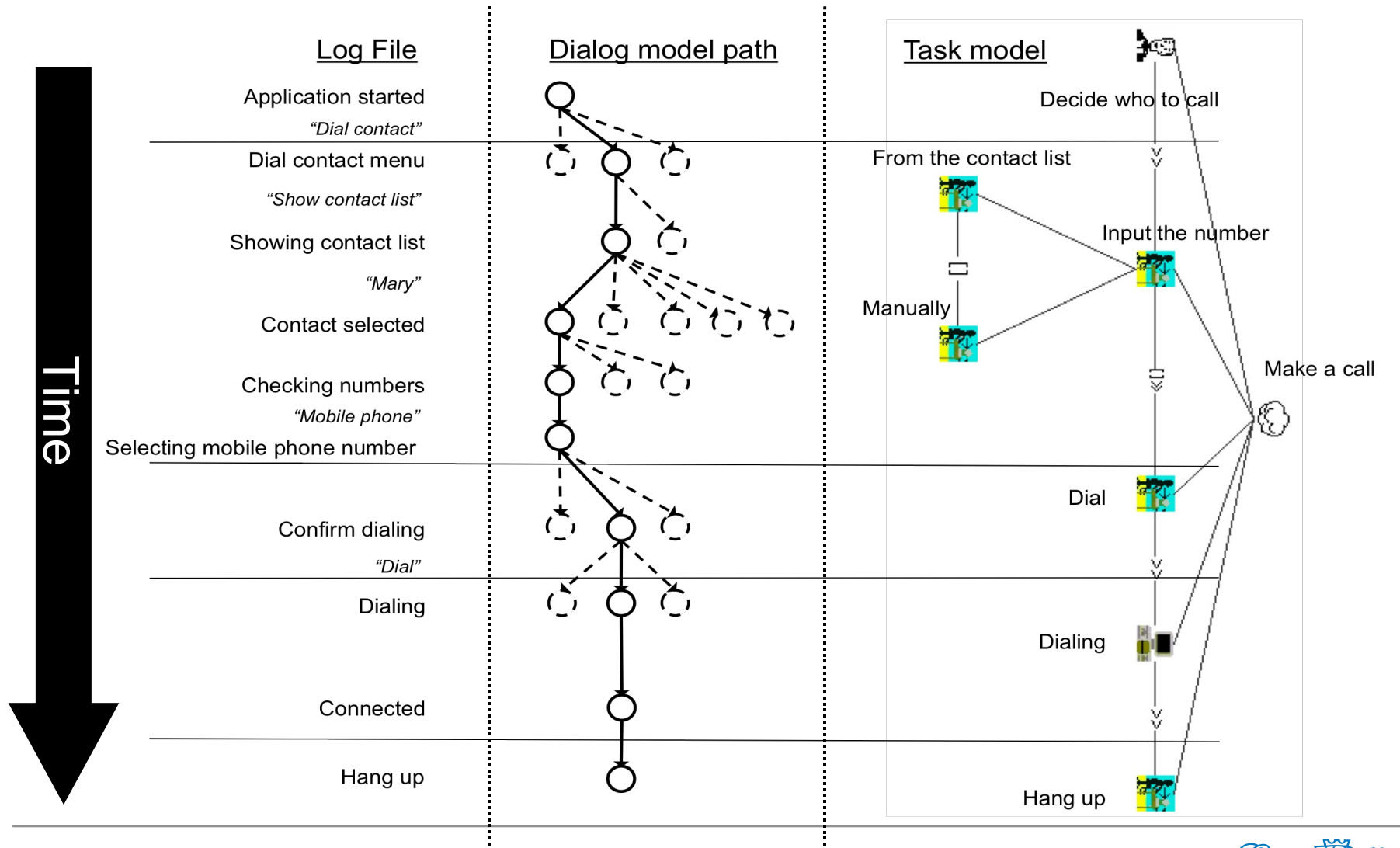
Time



Graph with application dialog model and log file



Combined task model, dialog model and log file



Visualization of detailed behavior



Visualization of user motion

level 3

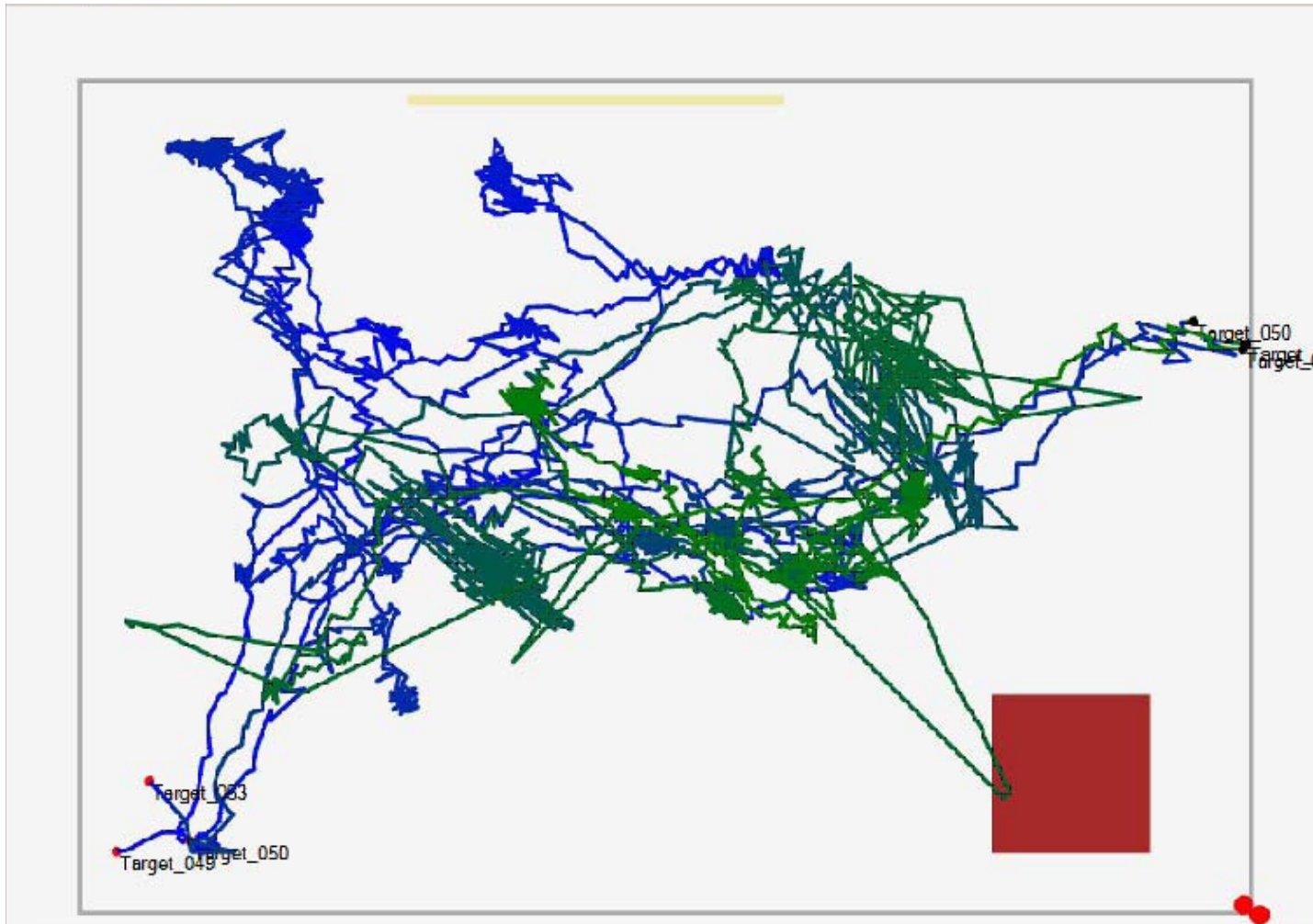
interaction with
program

level 2

detailed behavior

level 1

motion



Visualization of user motion

level 3

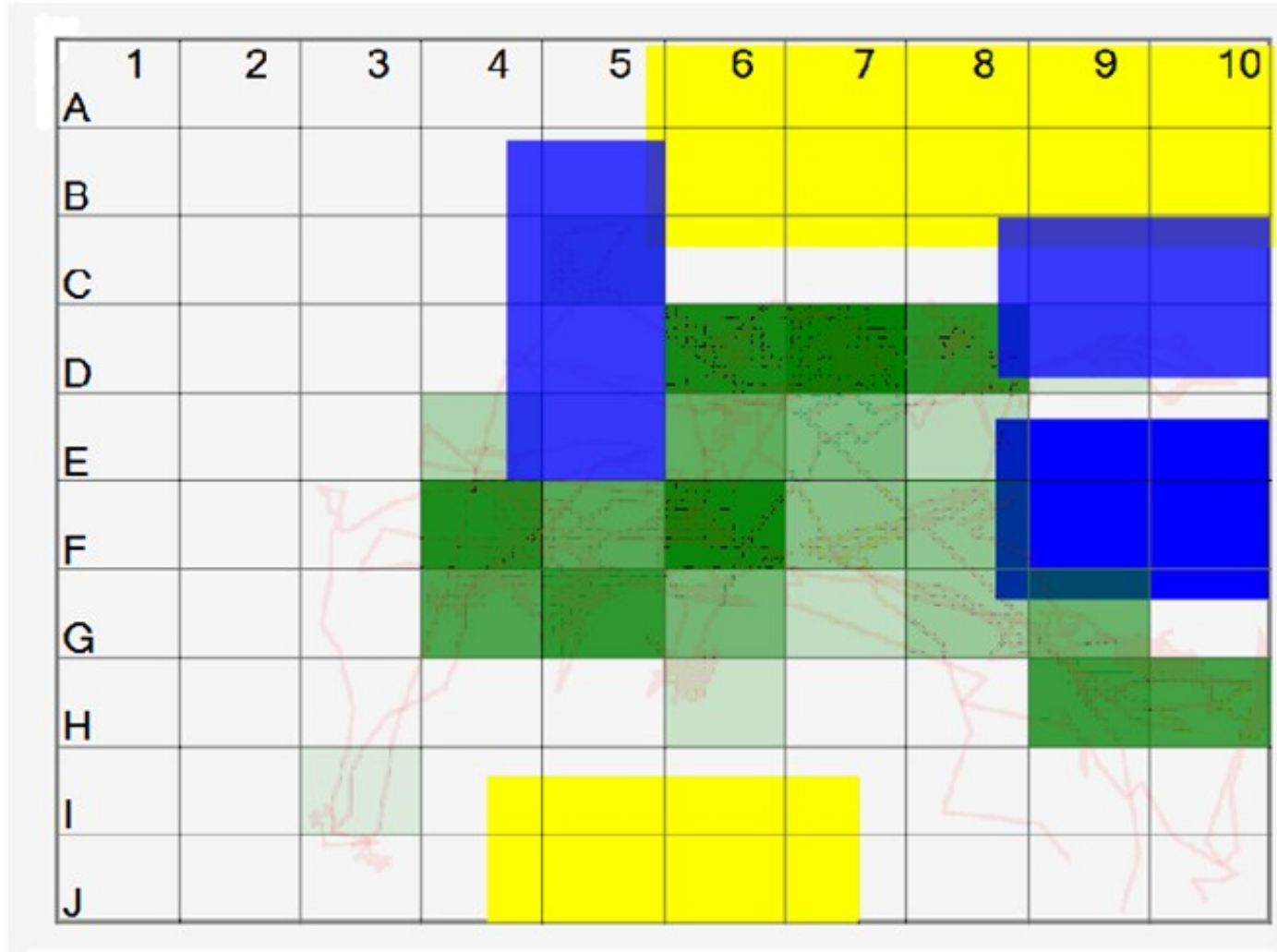
interaction with
program

level 2

detailed behavior

level 1

motion



Conclusion

- **Model of user behavior evaluation**
 - Interaction with application
 - User interaction with neighborhood
 - User motion behavior
- **Interactive visualization of user behavior using**
 - Timelines
 - Graphs
 - 3D visualization of the scene (VR)
 - 2D visualization of user motion



Future work

- **Use cognitive load as data sources interconnection**
 - high cognitive load may signal “interesting part of the test”
- **Discover misinterpretations of user behavior by semantic analysis of the data**
 - What was the user doing in last 5 minutes of the task 1. Was he solving a problem or was he calling home?
- **Build modular evaluation system packing all the visualization**



Publications

- [1] I. Malý, J. Cuřin, J. Kleindienst, and P. Slavík. Creation and visualization of user behavior in ambient intelligent environment. In *12th International Conference on Information Visualisation (IV08) - International Symposium of Human-Computer Interaction (HCI)*, London, United Kingdom, July 2008. IEEE Computer Society.
- [2] I. Maly, T. Macek, and P. Slavik. Car simulation environment for specialized research. In *Third Central European Multimedia and Virtual Reality Conference (CEMVR) 2006*, pages 101–107, Eger, Hungary, November 2006. Pannonian University Press.
- [3] I. Malý and P. Slavík. Towards visual analysis of usability test logs using task models. In *Proceedings of 5th International Workshop Task Models and Diagrams for Users Interface Design Conference (TAMODIA 2006)*, volume 4385 of *Lecture Notes in Computer Science (LNCS)*, pages 24–38, Hasselt, Belgium, October 2006. Springer.
- [4] I. Maly, P. Slavik, and J. Kleindienst. Combination of models and logs for visual analysis of data from usability evaluation. In *Proceedings of the 3rd IASTED International Conference on Human Computer Interaction (IASTED-HCI '08)*, Innsbruck, Austria, March 2008. Acta Press, Canada.
- [5] I. Maly and D. Tichy. Usability testing and development of car simulator - city rider. *Workshop CVUT*, 2007.
- [6] Z. Mikovec, I. Maly, P. Slavik, and J. Curin. Visualization of users' activities in a specific environment. In *Winter Simulation Conference (WSC) 2007*, pages 738–746, Washington DC, USA, December 2007. IEEE Computer Society.



Thank you for your attention



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