

Experimental paradigms in human movement science:  
Control of complex dynamics using sonification and visualization

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The domain: The part of social and cognitive functions that is grounded in interpersonal dynamics and synchrony, not so much in inner mental processes, theory of mind, etc..

A similar idea, in a more familiar domain

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Motor control and balance as a dynamic systems problem



Motor control and balance as a computational problem

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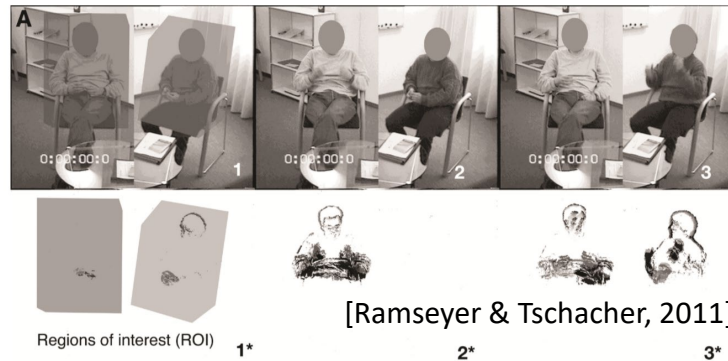


Synchrony with robots in ASD



[many projects]

... in psychotherapy



[Ramseyer & Tschacher, 2011]

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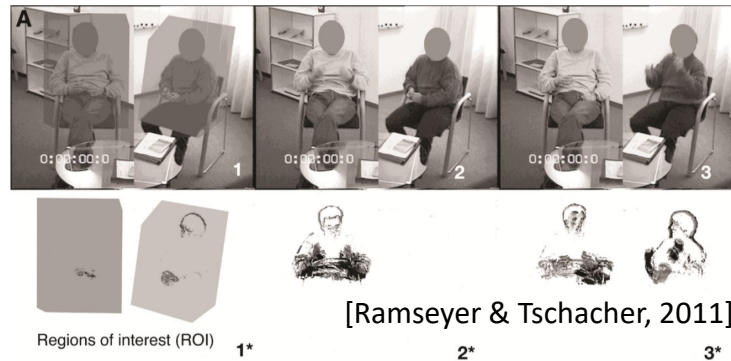
Joint action  
Interpersonal coordination  
Social neuroscience  
Second-person neuroscience  
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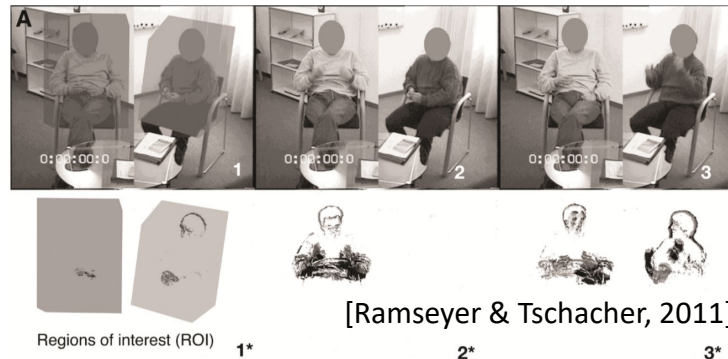
**We need more tools to record  
and manipulate interpersonal interactions**

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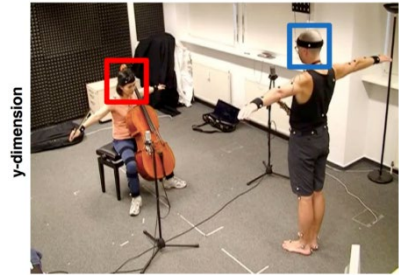
[Ramseyer & Tschacher, 2011]

## Tools to record and manipulate interpersonal interactions

# Tools to record and manipulate interpersonal interactions

People want this ...

**Performer 1** **Performer 2**



**Video data**



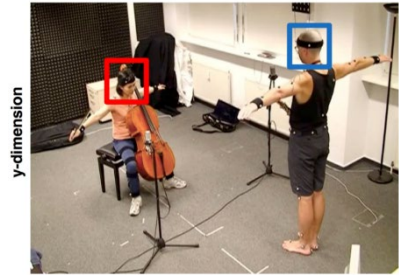
**MoCap data**

[Jakubowski et al., 2017]

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x-dimension  
**Video data**



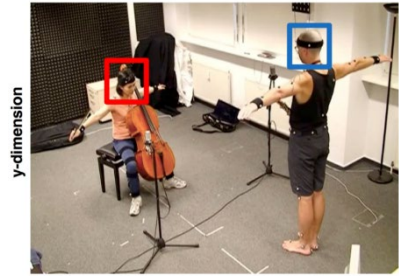
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[MoCap: Several highly specialized infrared cameras, proprietary software. Costs could go into tens of thousands.]

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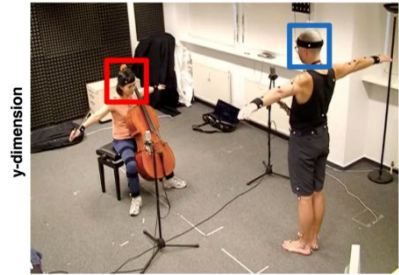
... but with much cheaper and portable hardware. A simple video camera and optical flow, computer vision's trusted old friend.

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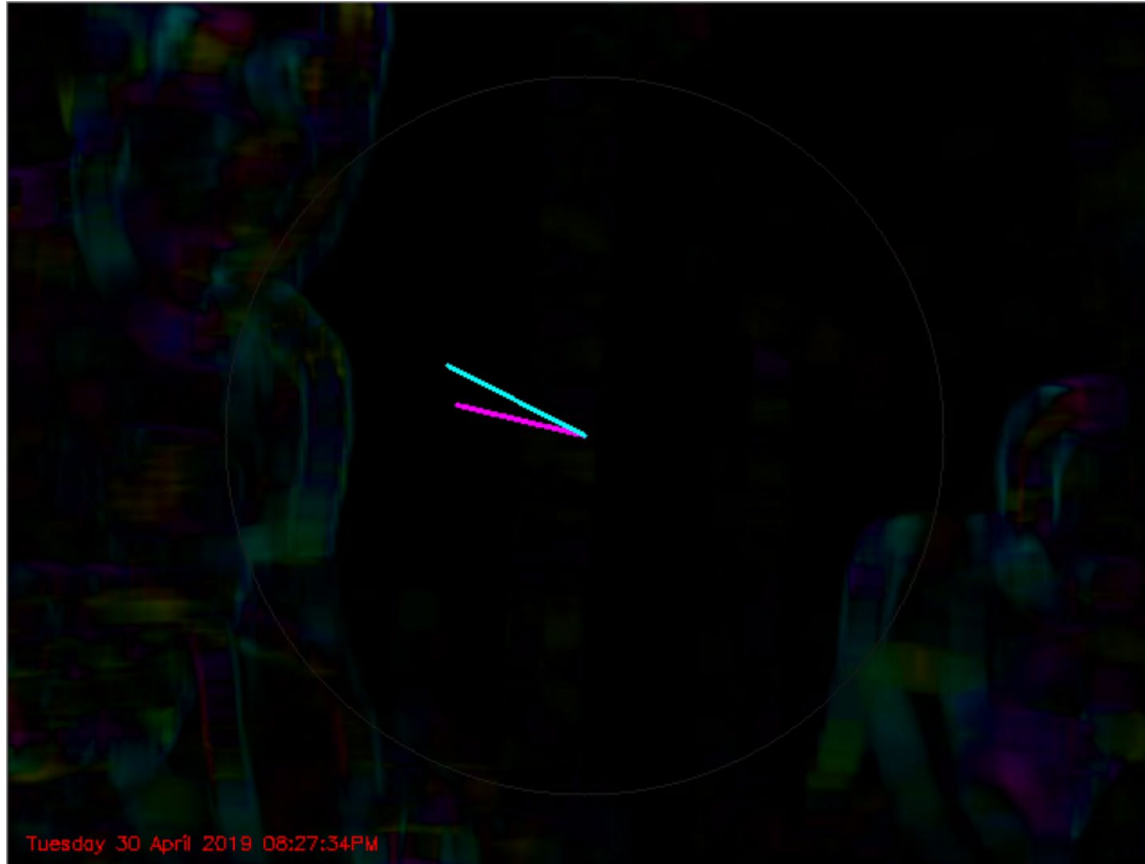


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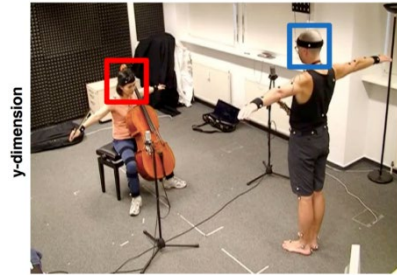
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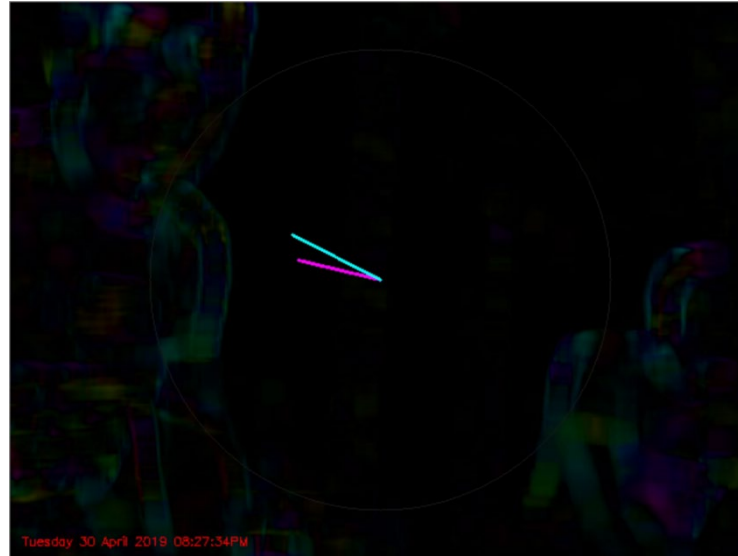
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The basic algorithms are available for Python (OpenCV).

Make an interface to record data and for real-time feedback (GUIs?).

Provide standard procedures to sanity check the setup.

Optimize things to increase the frame rate.

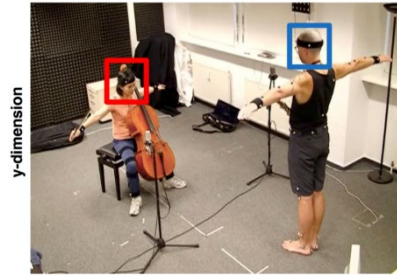
Allow the setup of customized (distorted, delayed, etc.) feedback.

Test different scenarios against ground truth from mocap.

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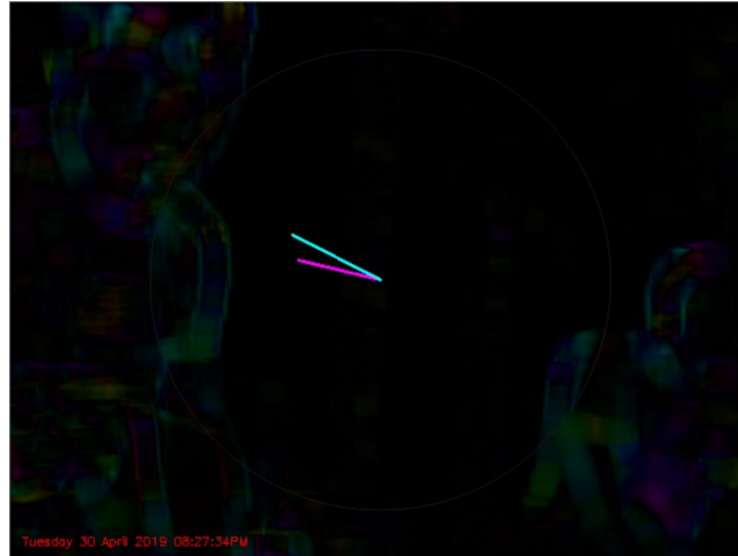
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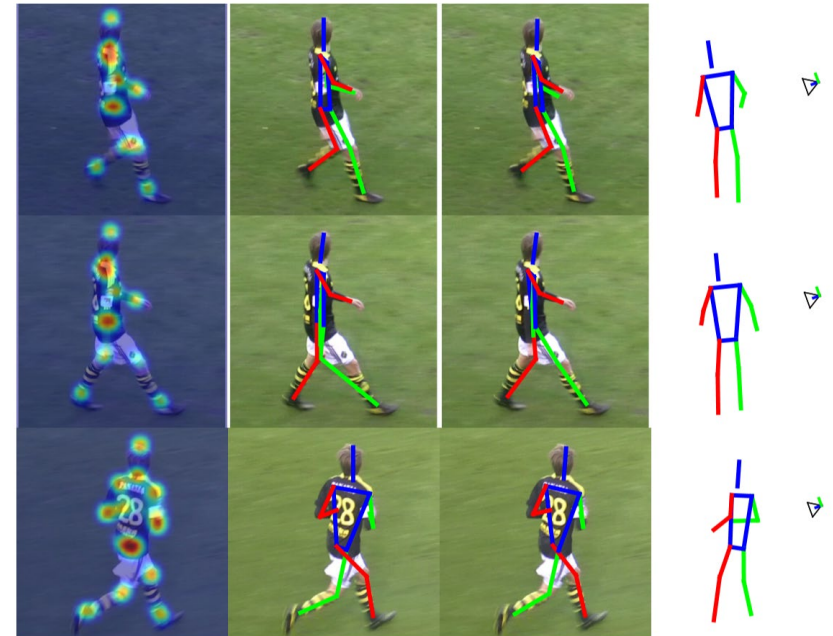
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Next, we need to go beyond a single gross motion vector and get a stick figure using CNNs (convolutional neural nets).



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This approach has been in the news lately.