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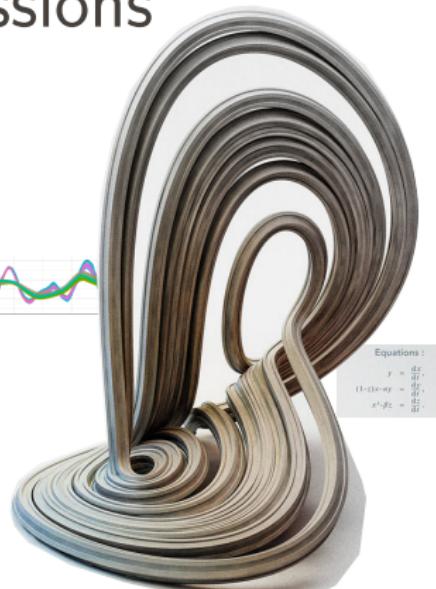
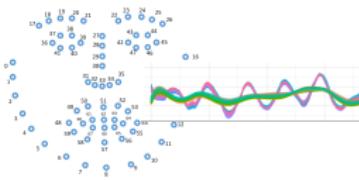
Towards the Analysis of Movement Variability for Facial Expressions with Nonlinear Dynamics

@CERE_Emotion #CERE2018

Glasgow, Scotland, 4-5 April 2018

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School of Engineering
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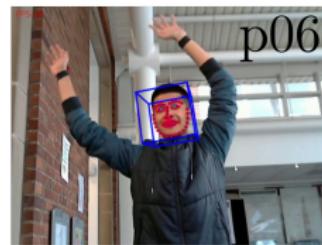
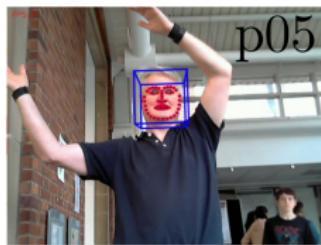
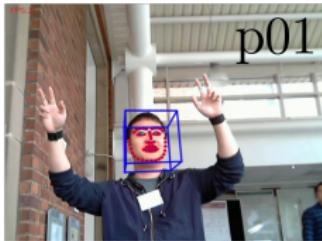
Equations :

$$\begin{aligned} \dot{x} &= dx/dt \\ &= ax - by \\ (1-a)x - ay &= dy/dt \\ &= c - xz \\ x^2\beta z &= dz/dt \end{aligned}$$

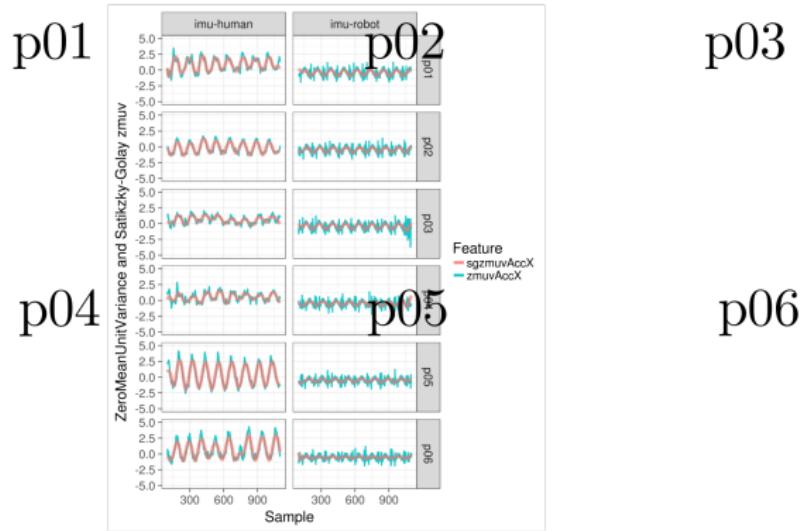
MOVEMENT VARIABILITY

WHAT IS MOVEMENT VARIABILITY?

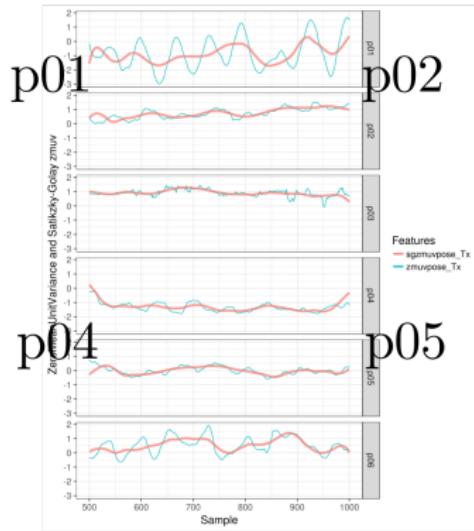
MOVEMENT VARIABILITY is defined as the variations that occur in motor performance across multiple repetitions of a task and such behaviour is an inherent feature within and between each person's movement.



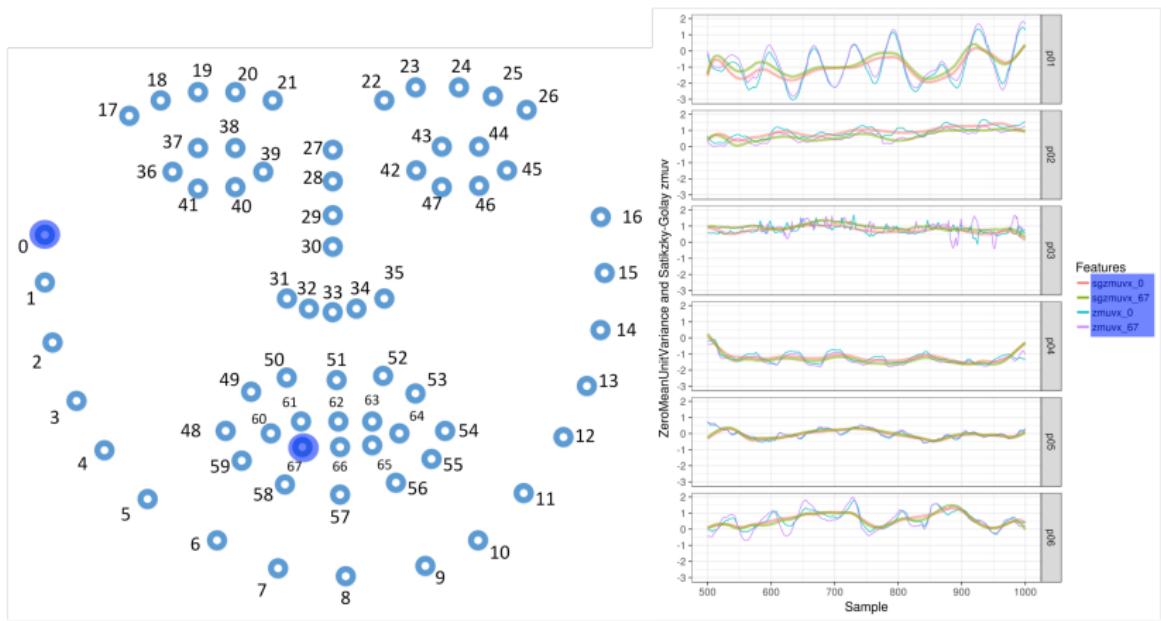
Movement Variability



IMU Time Series



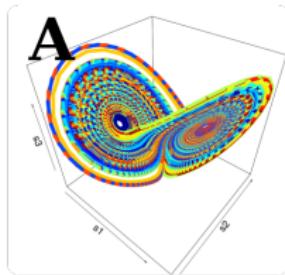
OpenFace Time Series



OpenFace Time Series

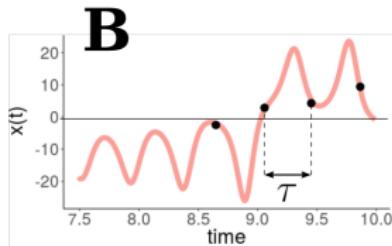
TIME VARYING FACIAL EXPRESSIONS

STATE SPACE RECONSTRUCTION



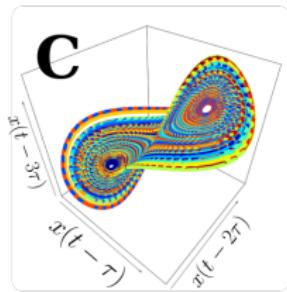
$h(s(t))$

A large black arrow points from the text $h(s(t))$ down towards the time series plot in panel B.



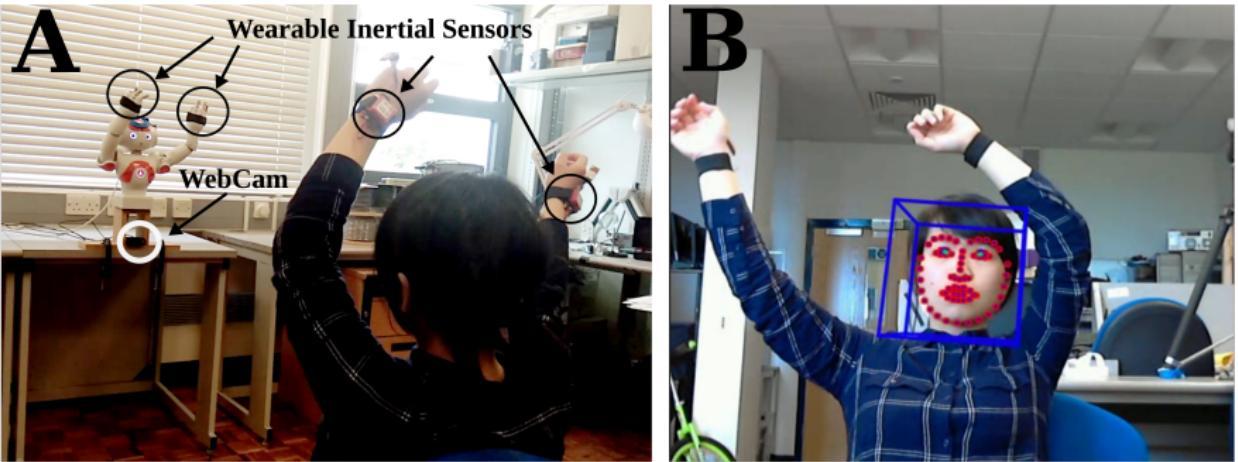
embedding
 (m, τ)

A large black arrow points from the text "embedding (m, τ) " to the 3D plot in panel C.



Uniform Time-Delay Embedding

EXPERIMENT AND RESULTS



Human-Robot Imitation

TODO LIST

1. 1
2. 2
3. 3

CONCLUSIONS AND FUTURE WORK

CONCLUSIONS FUTURE WORK

- Quantification Arm Movement Variability with Nonlinear Dynamics
 - However,
 - Timeseries from the landmarks are mounted on the pose location of the head.
-
- Test other techniques of Nonlinear Dynamics, e.g. Lyapunov Exponents, Recurrent Quantification Analysis
 - Use of Convolutional Neural Networks for automatic identification of Movement Variability

BIBLIOGRAPHY

- 
- Jostine Ho
»Facial Emotion Recognition«
GitHub repository (2016), <https://github.com/JostineHo/mememoji> [🔗]

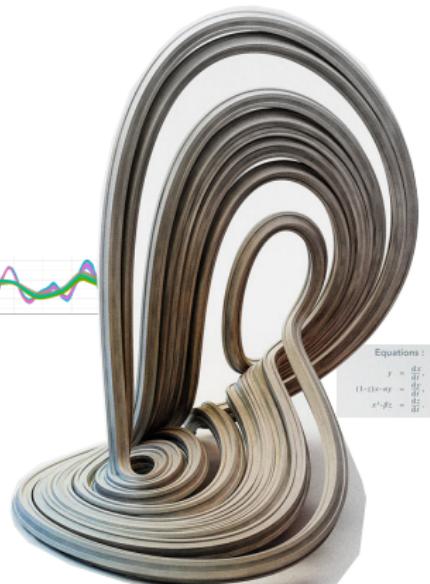
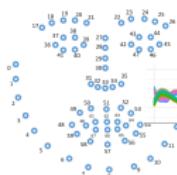
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<http://mxochicale.github.io/>



Equations :

$$\begin{aligned} \dot{x}_1 &= \frac{dx_1}{dt} \\ (1-\alpha)x_1\alpha y_1 &= \frac{dy_1}{dt} \\ x_1^2\beta z_1 &= \frac{dz_1}{dt} \end{aligned}$$



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