

Robotics in Africa Forum at IROS 2024



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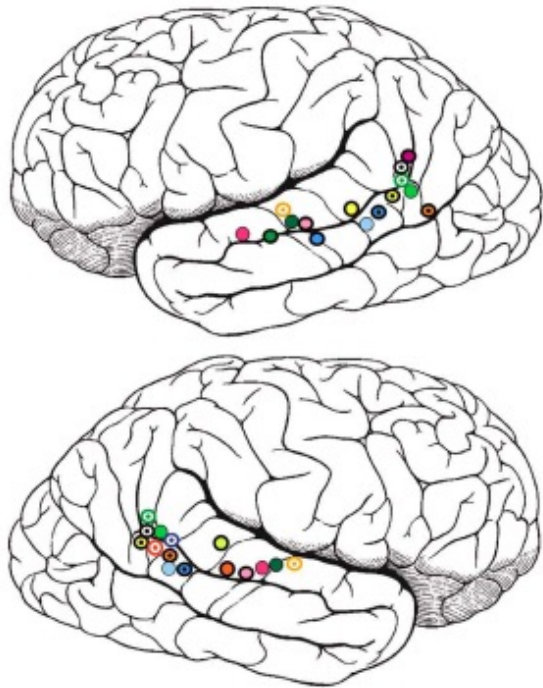
Biological Motion for Gestural Communication in Social Robots

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Humans are sensitive to biological motion during social interactions and tend to prefer these motion profiles (Puce and Perret, 2003)

Minimum Jerk Model of Biological Motion

(Chan et al., 2021)

$$CF = \frac{1}{2} \int_{t_1}^{t_2} \left[\left(\frac{d^3x}{dt^3} \right)^2 + \left(\frac{d^3y}{dt^3} \right)^2 \right] dt$$

Cost function being minimized



Joint position $\theta(t) = p_s + k \left[10(t/d)^3 - 15(t/d)^4 + 6(t/d)^5 \right]$

Joint velocity $\dot{\theta}(t) = \frac{k}{d} \left[30(t/d)^2 - 60(t/d)^3 + 30(t/d)^4 \right]$

Joint acceleration $\ddot{\theta}(t) = \frac{k}{d^2} \left[60(t/d) - 180(t/d)^2 + 120(t/d)^3 \right]$

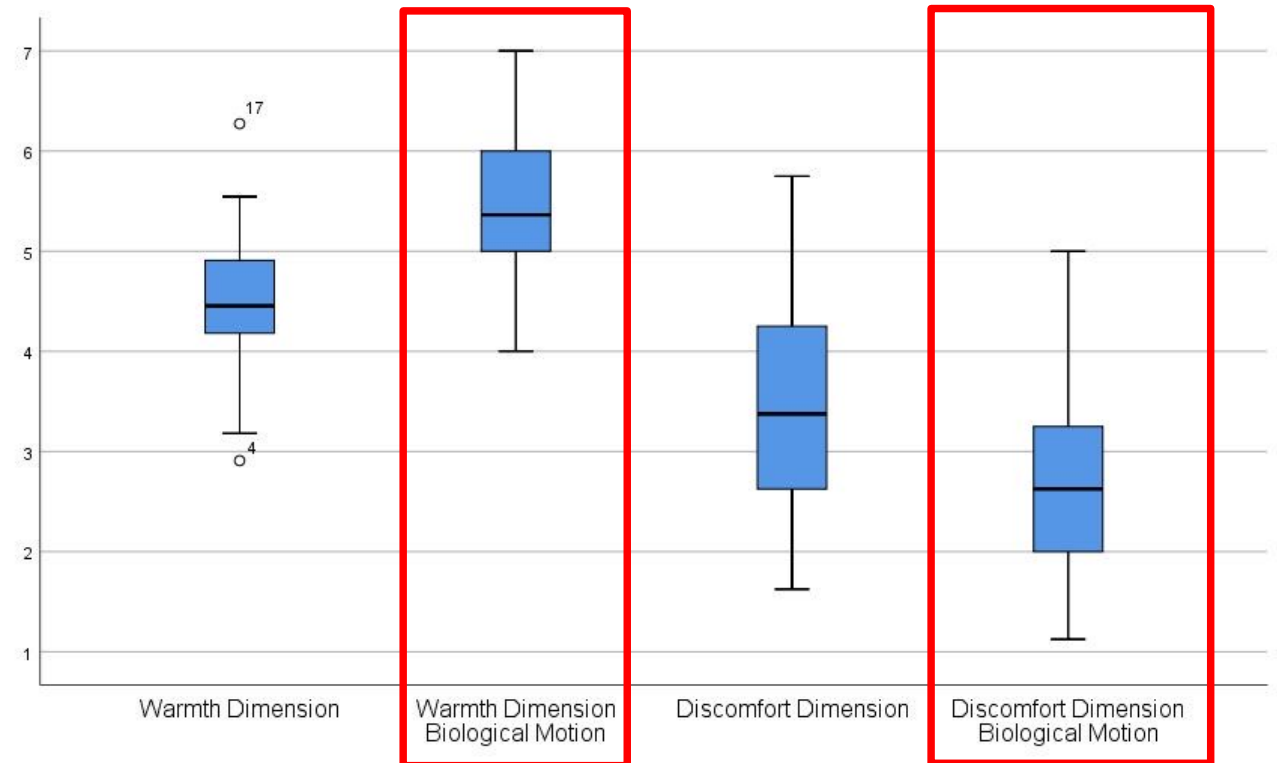
$0 \leq t \leq d$



Biological motion during human-robot interaction

Warmth **increased** on average by 14%

Discomfort **reduced** by 13%



References

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