

EMA data - cheat sheet

April 14, 2023

1 Gestural landmarks

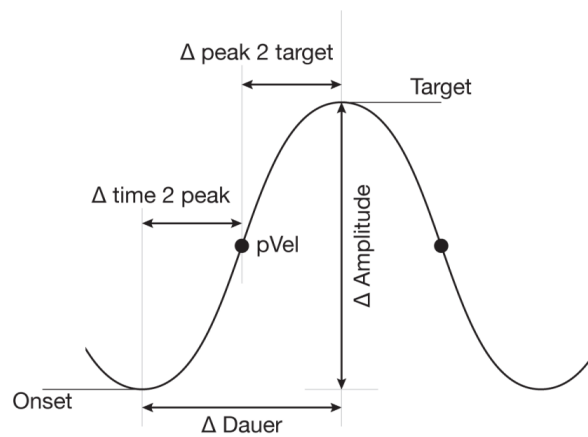


Figure 1: Landmarks and measurement intervals in the kinematic signal (Mücke, 2018, p. 58)

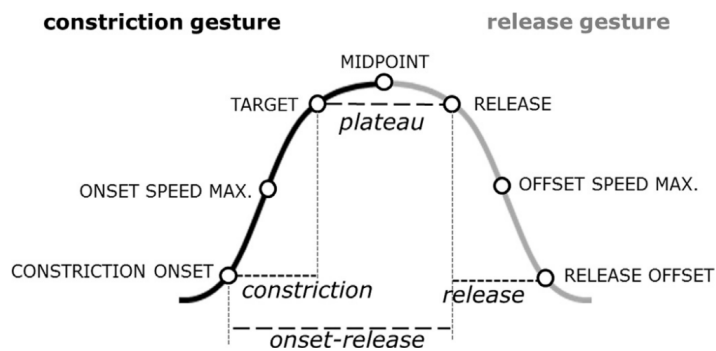


Figure 2: Gestural landmarks and intragestural intervals for a typical gestural complex (Tilsen, 2014, p. 28)

2 Defininig landmarks

2.1 velocity-based landmark detection

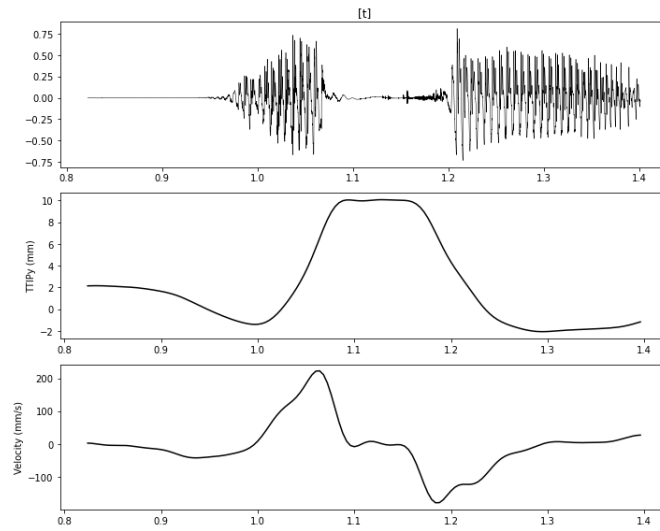


Figure 3: Example of a TTIP trajectory (vertical dimension) along with its velocity for a [ata] sequence

- peak velocity to = maximum velocity
- peak velocity from = minimum velocity
- target = 20% of the peak velocity to
- release = 20% if the peak velocity from

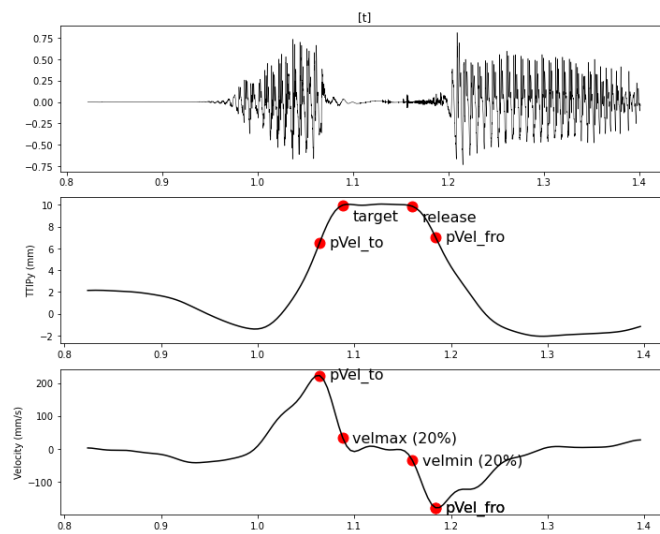


Figure 4: pVel_to, target, release and pVel_fro for the TTIP trajectory (vertical dimension) for [t]

- multiple options for onset and offset

1) first zero crossings before pVel_to and after pVel_fro

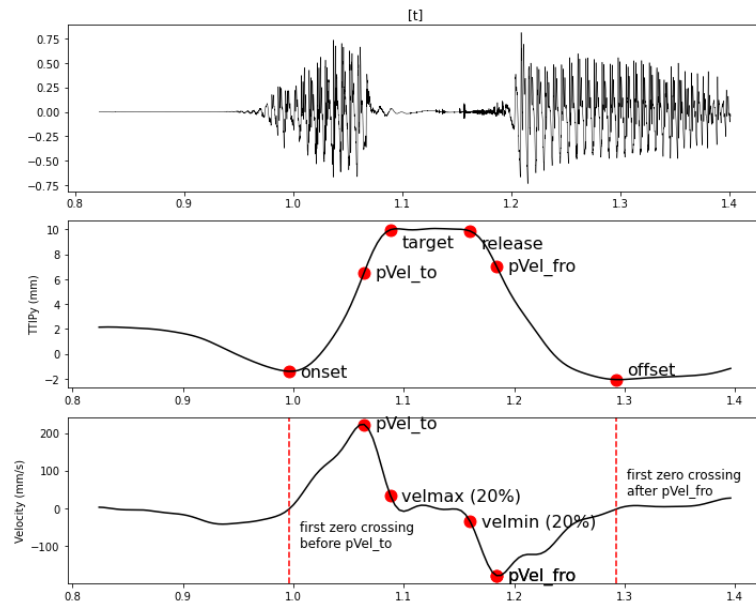


Figure 5: Detection of the gestural onset and offset based on velocity zero crossings

2) 20% peak velocity before pVel_to and after pVel_fro

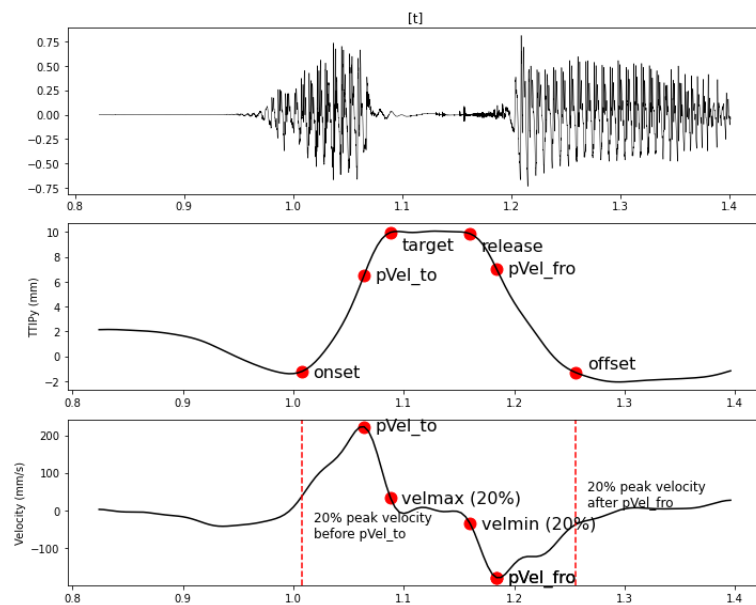


Figure 6: Detection of the gestural onset and offset based on 20% peak velocities

3) local minima

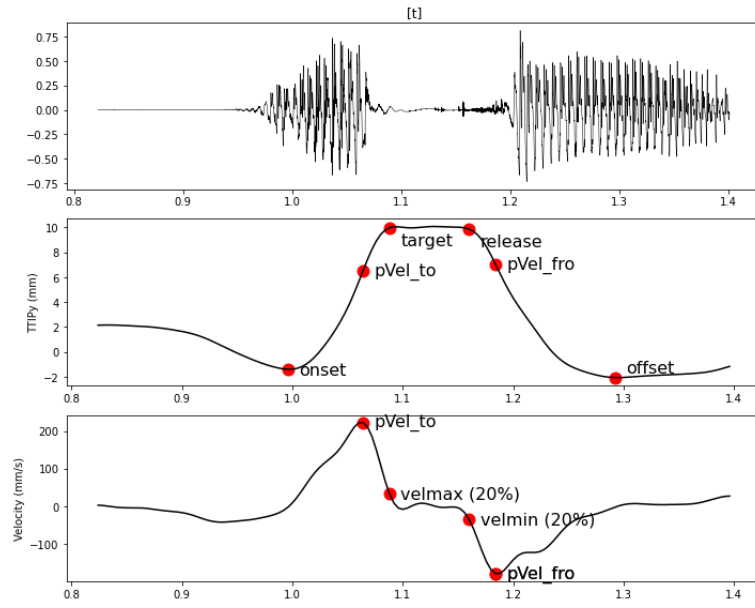


Figure 7: Detection of the gestural onset and offset based on local minima

2.2 Landmark detection based on tangential velocity

- Calculation of the tangential velocity:

$$tvel = \sqrt{VELOCITY_x^2 + VELOCITY_y^2} \quad (1)$$

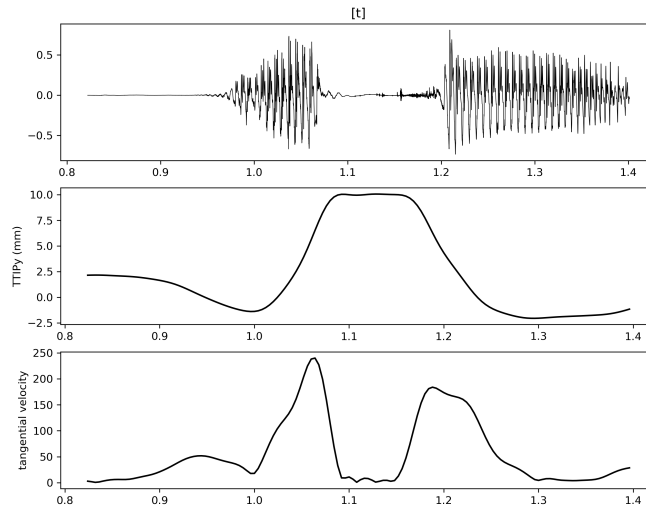


Figure 8: TTIPy trajectory along with the tangential velocity of TTIPx and TTIPy

- pVel_to and pVel_fro = highest maxima

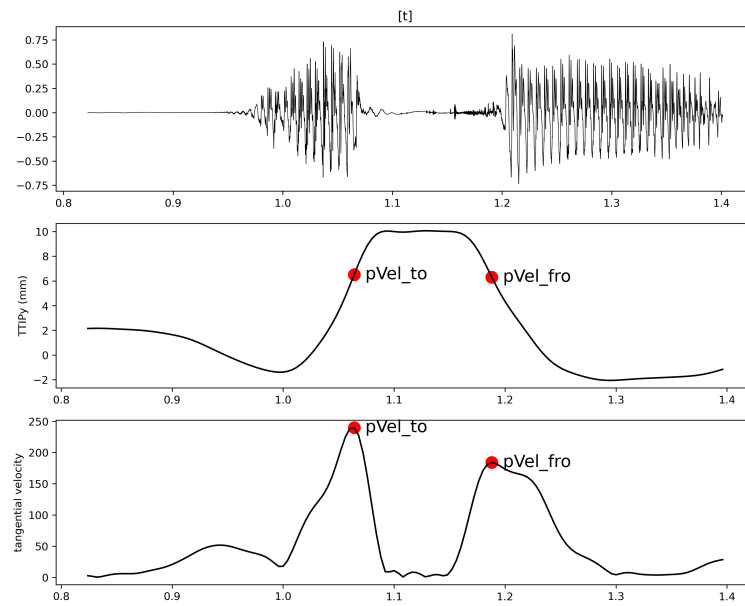


Figure 9: pVel_to and pVel_fro based on the tangential velocity

- target & release based on 20% peak velocities

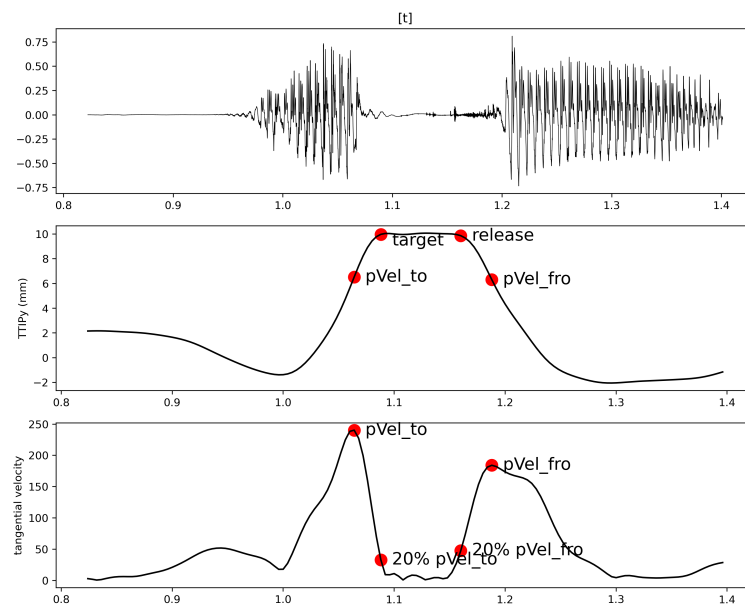


Figure 10: pVel_to and pVel_fro based on the tangential velocity

- onset & offset based on 20% peak velocities

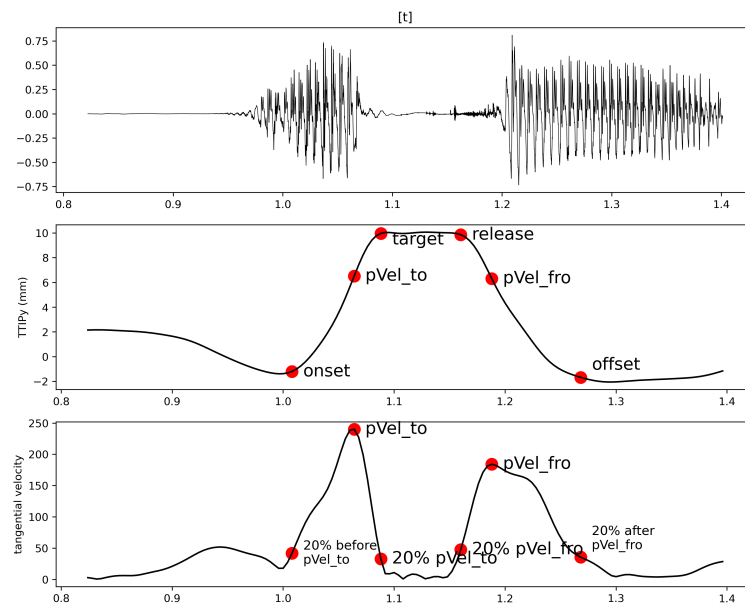


Figure 11: pVel_to and pVel_fro based on the tangential velocity

onset & offset based on local minima

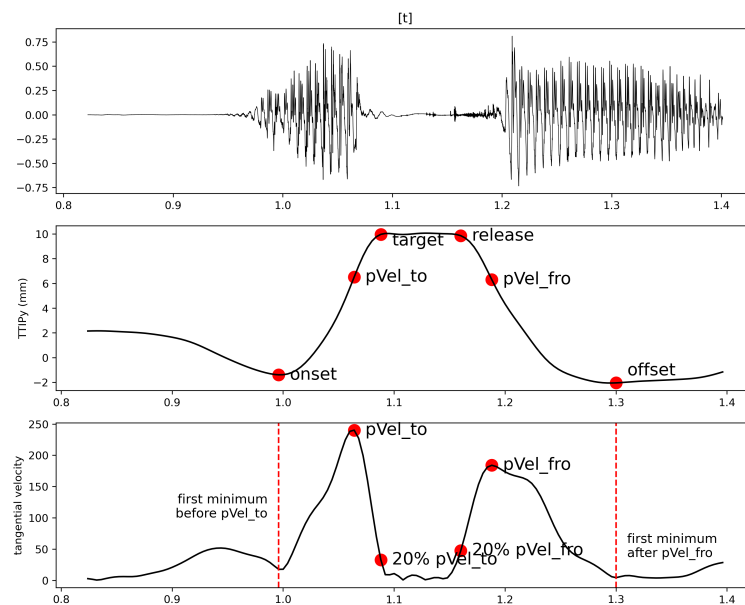


Figure 12: Onset and offset based on local minima in the tangential velocity

2.3 Acceleration?

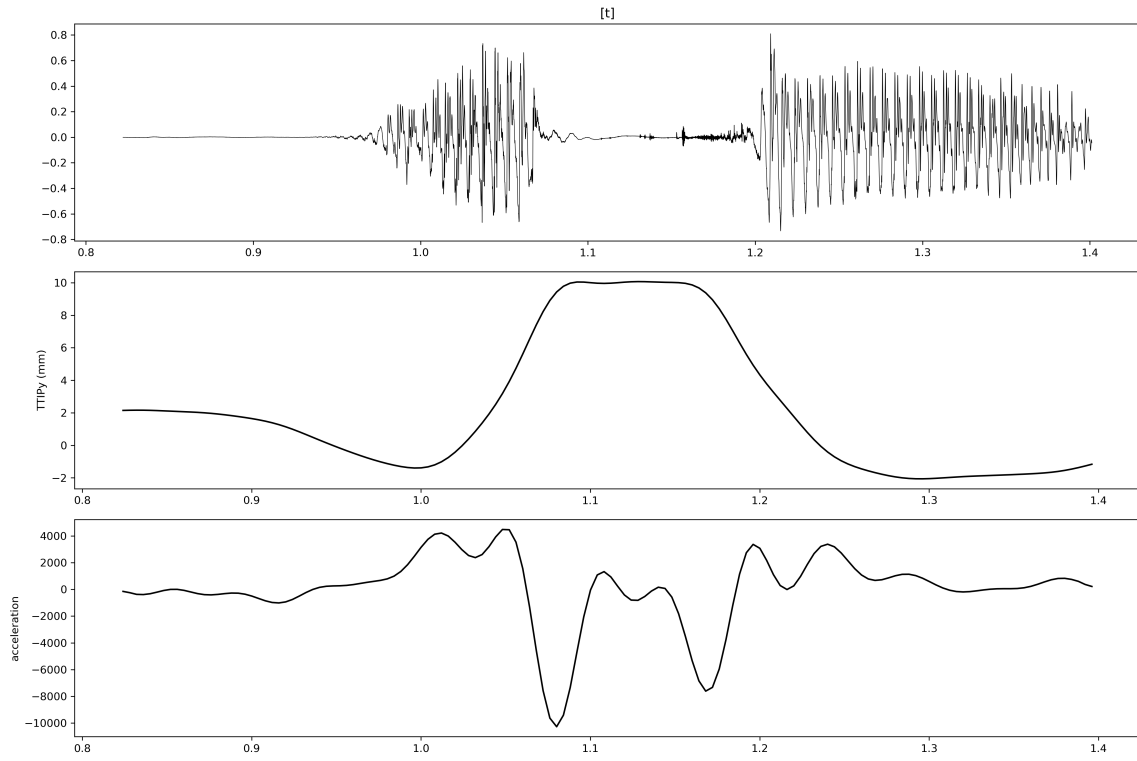


Figure 13: Waveform, TTIPy trajectory and acceleration of an [ata] sequence

3 Parameters

- amplitude

$$amplitude = target_y - onset_y \quad (2)$$

- stiffness

$$stiffness = \frac{pVel}{amplitude} \quad (3)$$

- acceleration phase

$$acc = pVel_{time} - onset_{time} \quad (4)$$

- deceleration phase

$$dec = target_{time} - pVel_{time} \quad (5)$$

- durations

$$release_{time} - target_{time} \quad (6)$$

$$offset_{time} - onset_{time} \quad (7)$$

$$target_{time} - onset_{time} \quad (8)$$

$$offset_{time} - release_{time} \quad (9)$$

References

- Mücke, D. (2018). *Dynamische Modellierung von Artikulation und prosodischer Struktur. Eine Einführung in die Artikulatorische Phonologie*. Language Science Press. <https://langsci-press.org/catalog/book/154>
- Tilsen, S. (2014). Selection and coordinatioin of articulatory gestures in temporally constrained production. *Journal of Phonetics*, 44, 26–46. <https://doi.org/10.1016/j.wocn.2013.12.004>