Multisensory Perception: From Integration to Remapping

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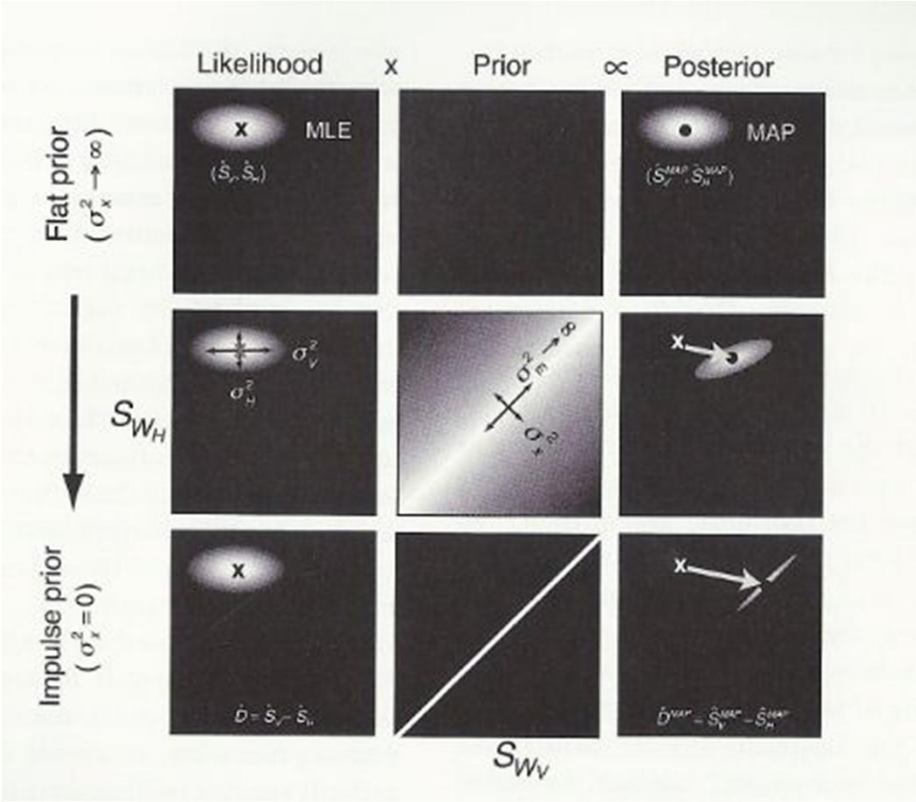
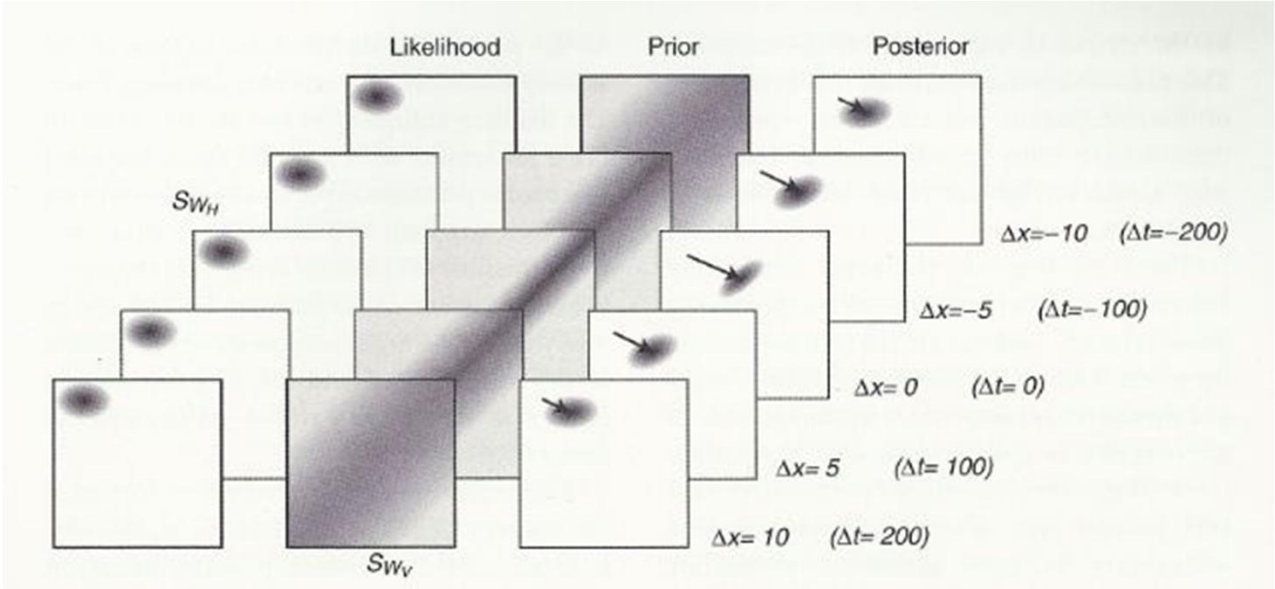
Sensory Input and Estimate

- SW_V and SW_H: physical stimuli
- S_V and S_H: sensory signal
- $\hat{S}_V$ and $\hat{S}_H$: sensory estimate
- V means visual and H means haptic.

Modeling Fusion, Partial Fusion, and Segregation

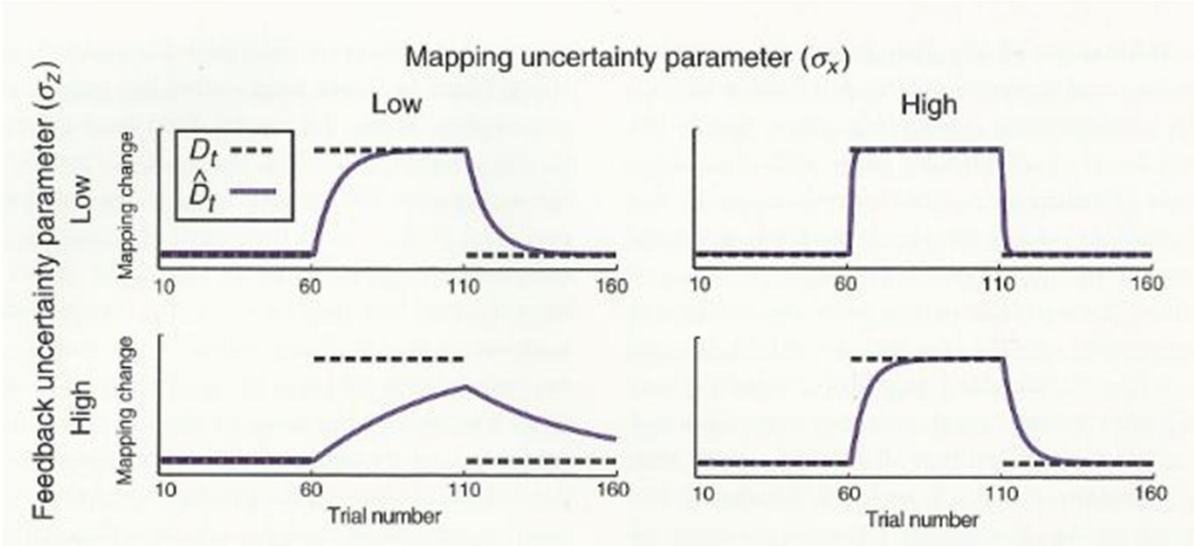


Breakdown of Integration



Spatial and temporal discordance

Remapping (1/2)



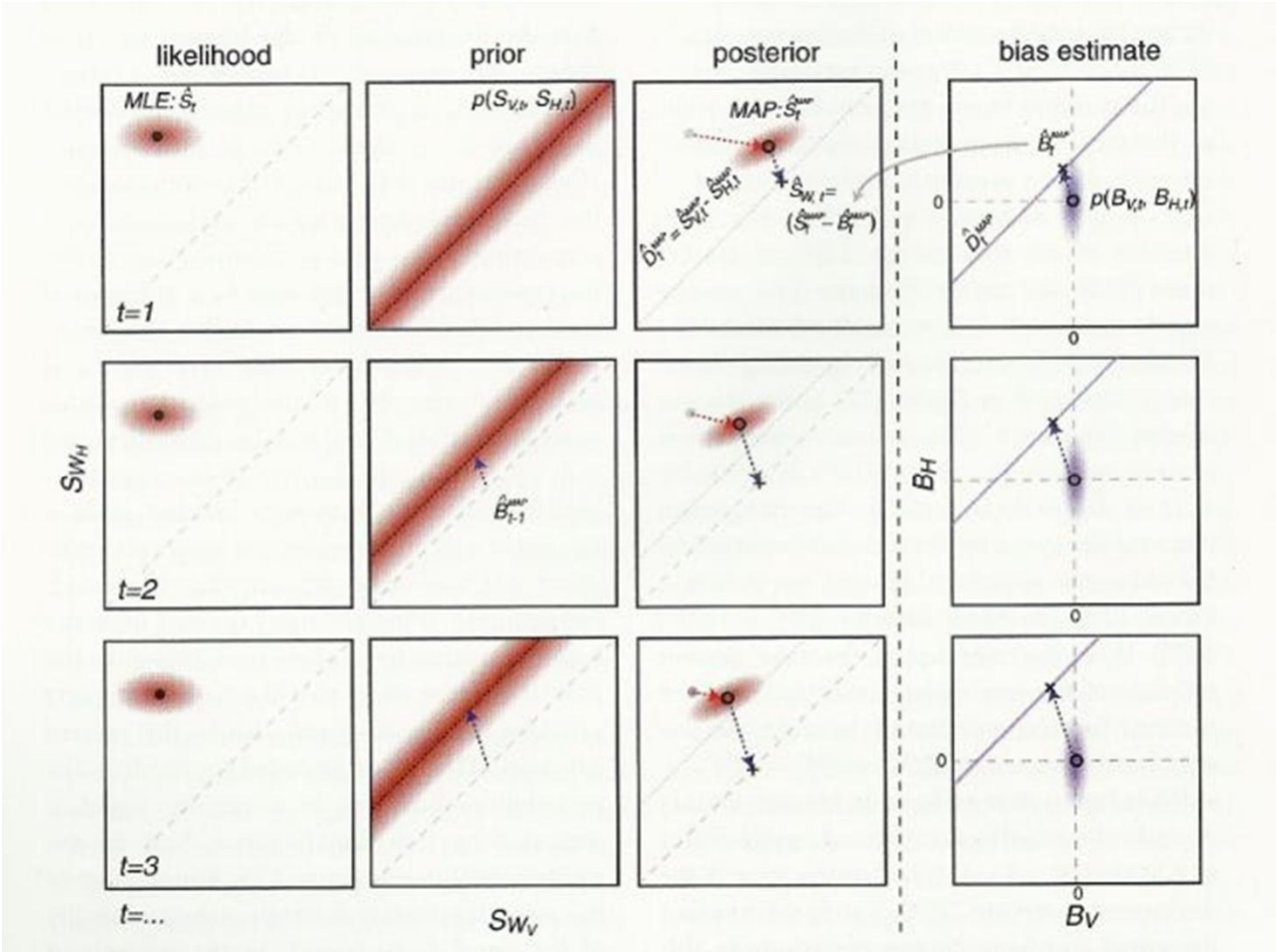
$$\hat{D}_t = \hat{S}_{F,t} - \hat{S}_{L,t}$$

Remapping (2/2)

$$\hat{D}_{t^+}^{MAP} = w_x \hat{D}_{t^-} + w_z \hat{D}_t$$
$$= \hat{D}_{t^-} + K(\hat{D}_t - \hat{D}_{t^-})$$

- The value K is a proportion of the error signal by which the visuomotor mapping is adjusted.
- We refer to K as the Kalman gain.
- $w_x = \frac{\sigma_z^2}{\sigma_z^2 + \sigma_x^2}$, $w_z = \frac{\sigma_x^2}{\sigma_z^2 + \sigma_x^2}$, $K = \frac{\sigma_x^2}{\sigma_z^2 + \sigma_x^2}$

From Integration to Remapping



Concluding Remarks and Some Open Questions (1/2)

- One major problem that we face currently with the Bayesian approach is that the prior distribution, which are used to represent the statistics of the sensory signals derived from the environment, are merely postulated.
- The reason that they are only postulated is that they are not easily measurable.

Concluding Remarks and Some Open Questions (2/2)

- Future research needs to address how priors can be determined, measured, or manipulated independently.