Switching between Off and On in the Macaque Visual System

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Response (spikes/s)

Stimulus (P-preferred, A-antiprefered)
preferred (P)
antiprefered (A)
antipreferred (A) \[\iff\] preferred (P)

Response diff. (spikes/s) relative to stimulus transition

\[\Delta_{AP}\]
Response diff. (spikes/s)

LGN

parvo

Time relative to stimulus transition (ms)
A

P

LGN

parvo

magno

Response diff. (spikes/s)

Time relative to stimulus transition (ms)
Response diff. (spikes/s)

LGN

parvo

magno

Time relative to stimulus transition (ms)
Response diff. (spikes/s)

Time relative to stimulus transition (ms)

LGN
parvo
magno

V1 simple
Response diff. (spikes/s)

Time relative to stimulus transition (ms)

V1 simple

V1 complex

MT
LGN parvo counterphase
LGN magno counterphase
V1 simple counterphase
V1 simple orthogonal
V1 complex direction
MT direction

A
P

# of cells

ΔAP (ms)
Input

Linear transform (boxcar integration)
Input

Linear transform (boxcar integration)

On

Off
Input

Linear transform (boxcar integration)

threshold

On

Off
Input

Linear transform (boxcar integration)

threshold

On Off
Input

Linear transform (boxcar integration)
Input

Linear transform (boxcar integration)
Input

Linear transform (boxcar integration)
Input

Linear transform (boxcar integration)
Input

Linear transform (boxcar integration)

threshold

On  Off
Input

Linear transform (boxcar integration)

On  Off

threshold
Input

Linear transform (boxcar integration)

threshold

On

Off
Spontaneous firing rate (spikes/s)

MT

ΔAP (ms)

LGN

V1 simple

V1 complex

MT

# of cells

0 10 20 30 40

0 10 20 30

0 10 20 30 40

0 10 20 30 40

0 10 20 30

0 10 20 30
Response diff. (spikes/s)

Time relative to stimulus transition (ms)

LGN
parvo

V1
simple

V1
complex

V1
(orthog.)

20
-20

MT

10 30 50

P

A
V1 complex direction

Response (spikes/s)

Time (ms)

Rate difference, N-A (spikes/s)

ΔNP / ΔAP

[V1 complex direction]

[V1 complex direction]
LGN parvo

Time (ms)

80 spikes/s

P
A
LGN parvo

Time (ms)

-10 0 10 20 30 40 50 60 70 80

80 spikes/s
80 spikes/s

LGN parvo

Time (ms)

P
A
LGN parvo

80 spikes/s

V1 simple

Time (ms)

-10 0 10 20 30 40 50 60 70 80

P

A
80 spikes/s

LGN parvo

V1 simple

V1 complex
direction sel.

Time (ms)

P A
80 spikes/s

LGN parvo

V1 simple

V1 complex
direction sel.

Time (ms)
80 spikes/s

LGN parvo

V1 simple

V1 complex direction sel.

Time (ms)

PA
Summary

1. Switching Off is faster than switching On
2. Timing asymmetry is correlated with firing rate
3. Preferred, null, and antipreferred
4. History dependence shows various trends
5. On time is more variable than Off time