ODIN: **O**cular **D**ivergence re**IN**tegration

Intro Text

Concept Drawing

System Diagram

System description

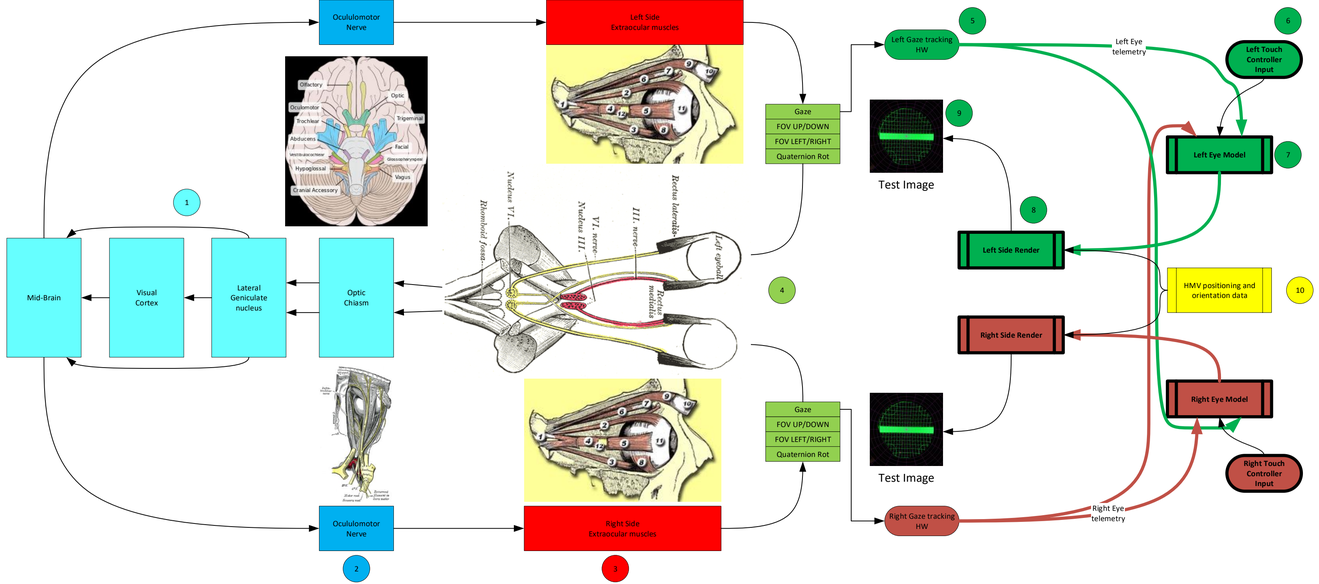
ODIN: **O**cular **D**ivergence re**IN**tegration

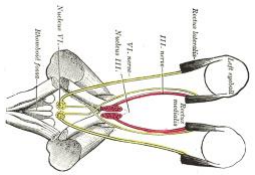
Translation/rotation correction

Concept Drawing

Software description

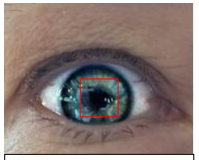
SW diagram


Ocululomotor Nerve
Left Side Extraocular muscles
Olfactory
Optic
Oculomotor
Trigeminal
Trochlear
Abducens
Facial
Vestibulocochlear
Glossopharyngeal
Hypoglossal
Vagus
Spinal Accessory
Nucleus VI
Nucleus III
VI nerve
III. nerve
Rectus lateralis
Left eyeball
Rectus medialis
Rhomboid fossa
Mid-Brain
Visual Cortex
Lateral Geniculate nucleus
Optic Chiasm
Gaze
FOV UP/DOWN
FOV LEFT/RIGHT
Quaternion Rot
Left Gaze tracking HW
Left Eye telemetry
Left Touch Controller Input
Test Image
Left Eye Model
Left Side Render
HMV positioning and orientation data
Right Side Render
Right Eye Model
Right Touch Controller Input
Test Image
Right Gaze tracking HW
Right Eye telemetry
Right Side Extraocular muscles
Oculumotor Nerve
1
2
3
4
5
6
7
8
9
10

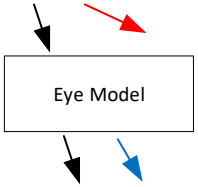


Human

Eye Monitoring

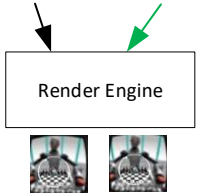


Gaze Inference



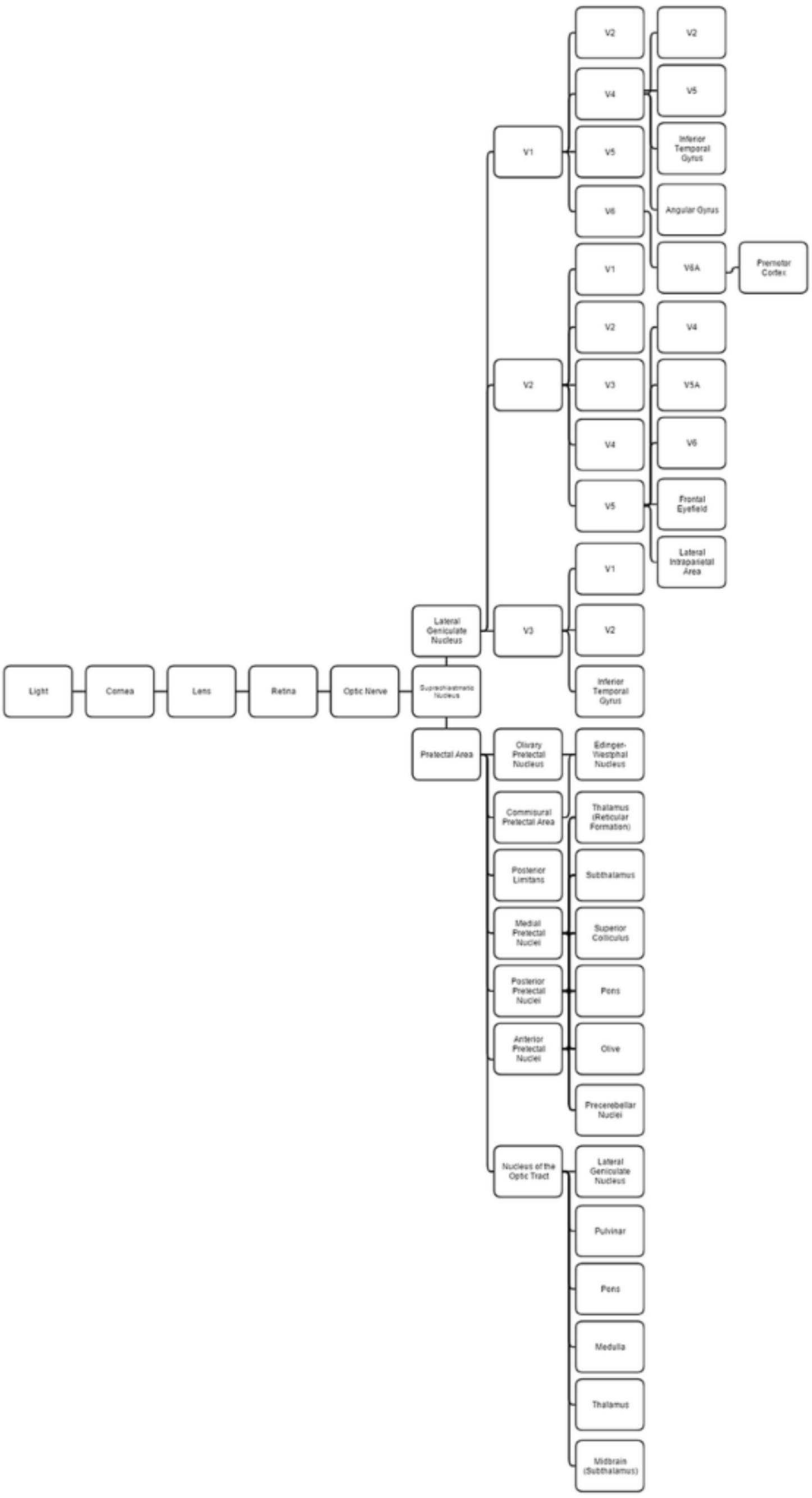
Gaze Prediction

Gaze Correction

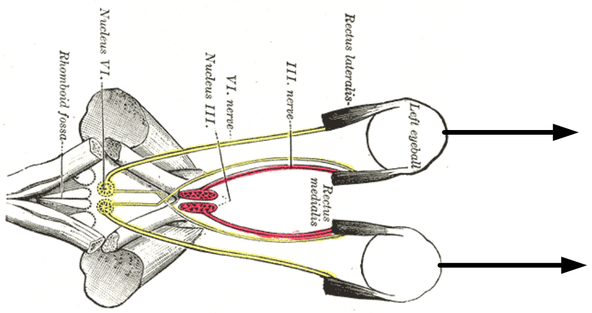


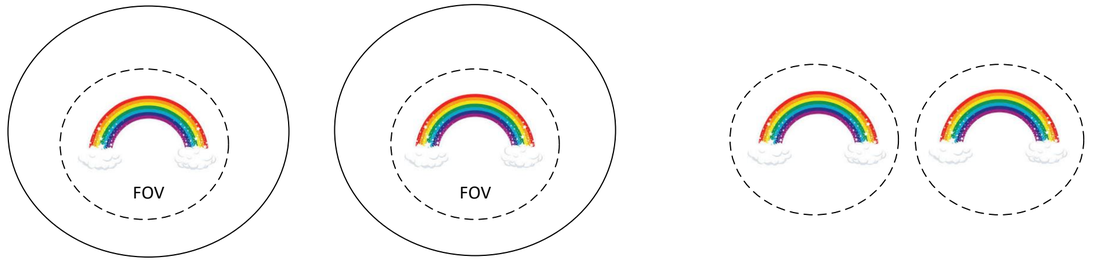
FOV Render

Human

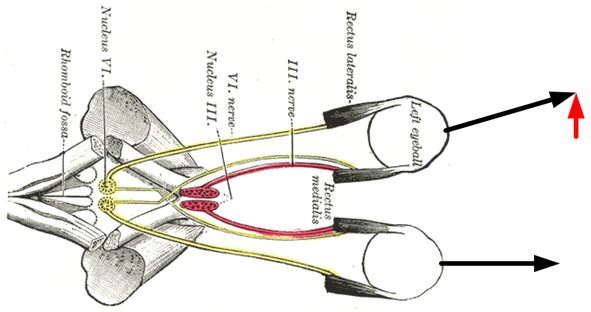

Light
Cornea
Lens
Retina
Optic Nerve
Suprachiasmatic Nucleus
Lateral Geniculate Nucleus
Pretectal Area
V1
V2
V3
V4
V5
V6
V1
V2
V3
V4
V5
V1
V2
V3
V4
V5
V6
V6A
Premotor Cortex
Inferior Temporal Gyrus
Angular Gyrus
V4
V5A
V6
Frontal Eyefield
Lateral Intraparietal Area
Olivary Pretectal Nucleus
Commisural Pretectal Area
Posterior Limitans
Medial Pretectal Nuclei
Posterior Pretectal Nuclei
Anterior Pretectal Nuclei
Nucleus of the Optic Tract
Edinger-Westphal Nucleus
Thalamus (Reticular Formation)
Subthalamus
Superior Colliculus
Pons
Olive
Precerebellar Nuclei
Lateral Geniculate Nucleus
Pulvinar
Pons
Medulla
Thalamus
Midbrain (Subthalamus)

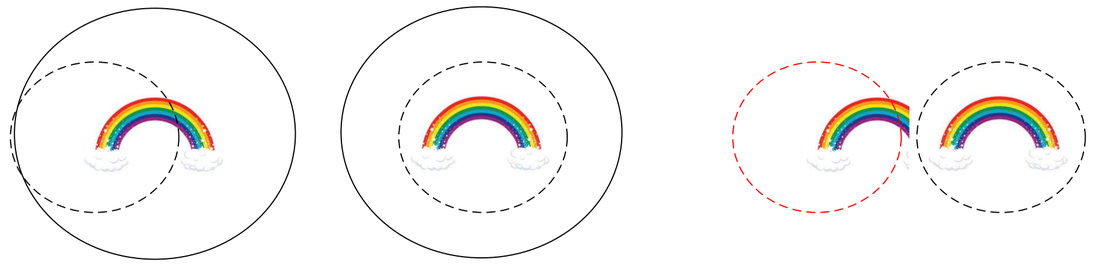
Left Display | Right Display | Left POV | Right POV



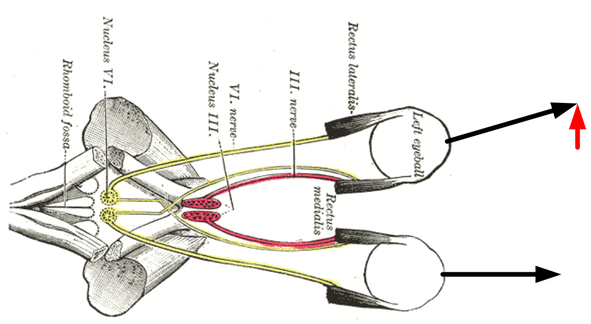


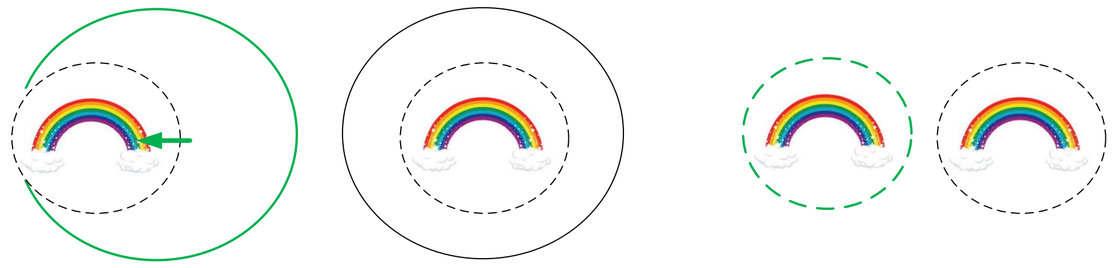
Normal Ocular Divergence



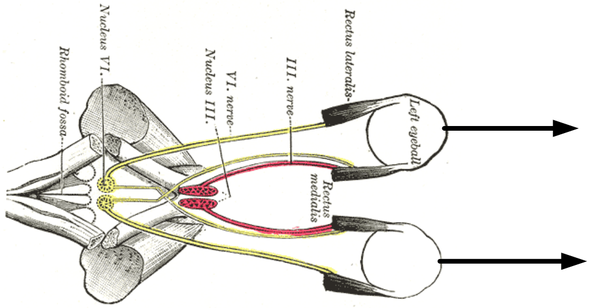


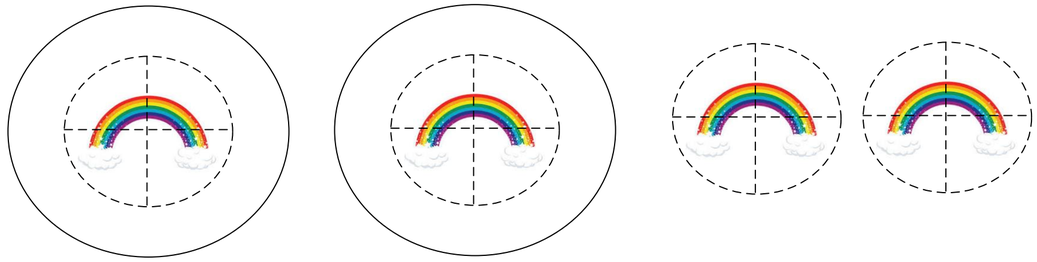
Uncorrected Ocular Translational Divergence



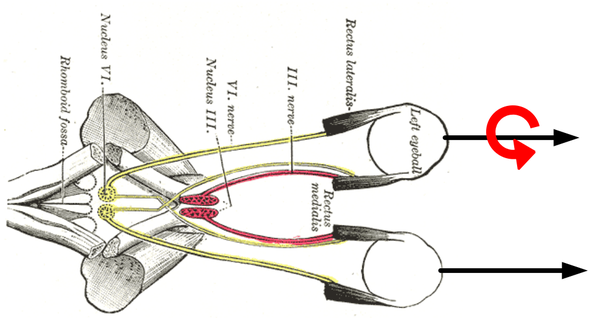


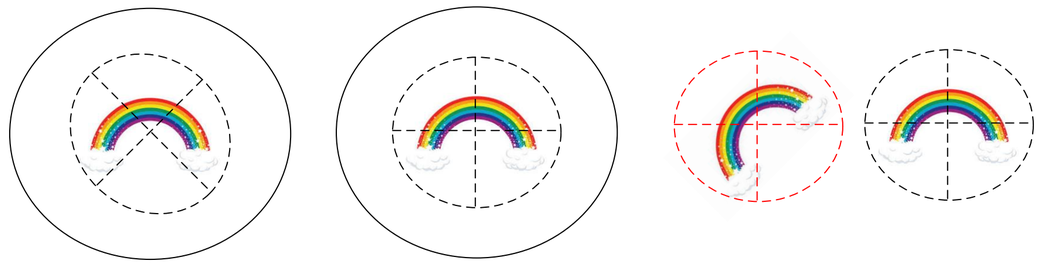
Reintegrated Ocular Translational Divergence



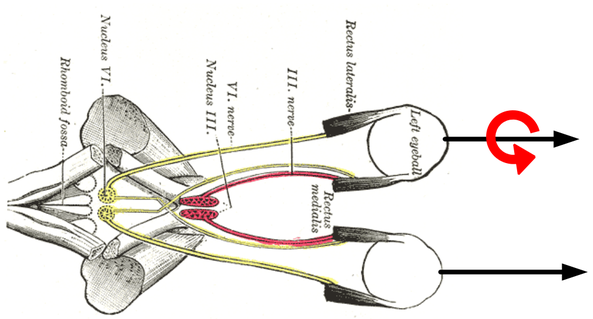


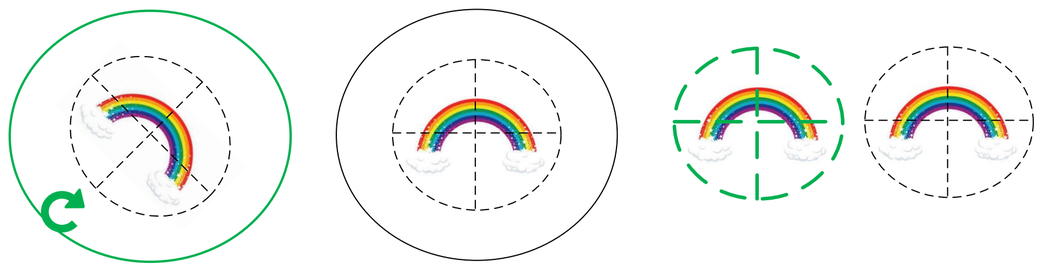
Normal Ocular Divergence



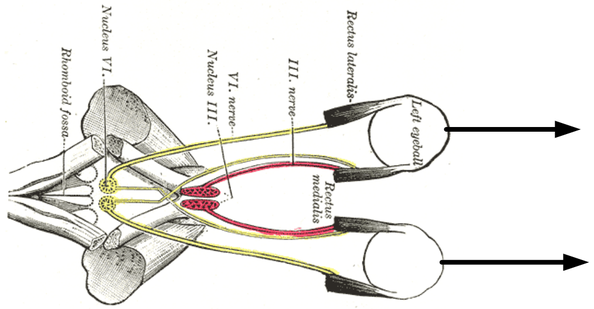


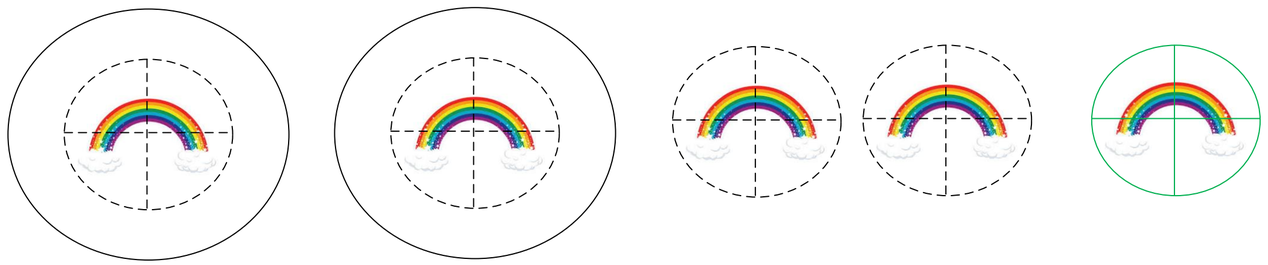
Uncorrected Ocular Rotational Divergence



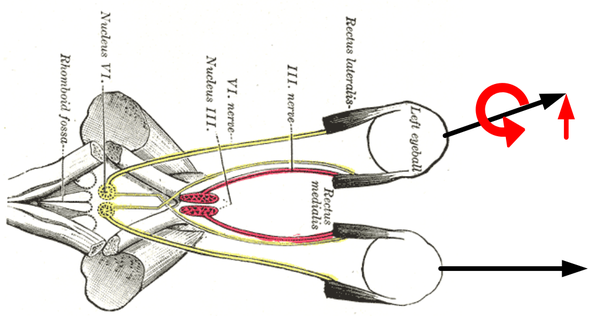


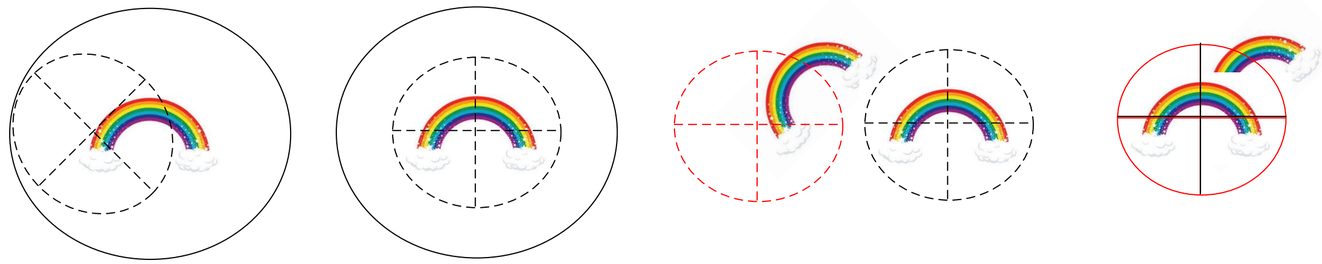
Corrected Ocular Rotational Divergence





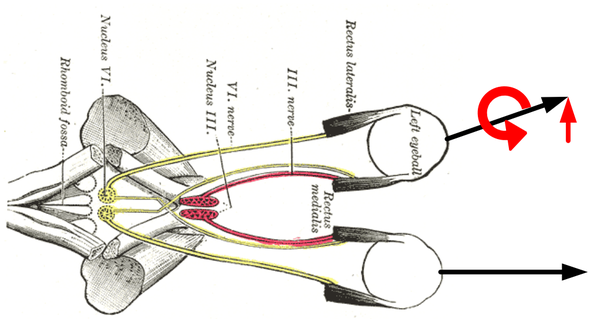
Normal Ocular Divergence

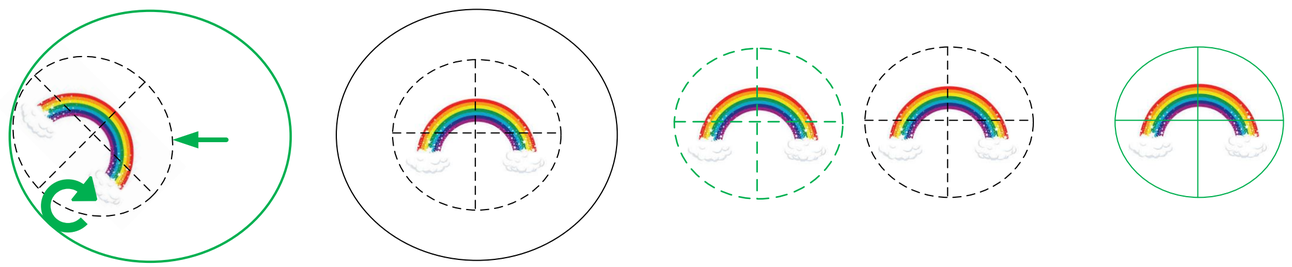




Double Vision!

Uncorrected Ocular Divergence with both Rotational and Translational components





Corrected Ocular Rotational Divergence


Left touch input
Left Gaze Capture
Calibration
Right Gaze Capture
Right Touch Input
Training
Left Eye Model
Model
Right Eye Model
Left Eye Corrections
Prediction
Right Eye Corrections
Left Eye FOV Render
Execution
Right Eye FOV Render
Left Corrected FOV
Corrected Vision
Right Corrected FOV

Describe your invention:What problem(s) does your invention solve?

There is a class of Oculomotor disorders that result in divergence of gaze. Sometimes this divergence can be overcome by physical therapy or via rewiring of visual integration. In many cases, there is no cure, and patients must learn to cope with diplopia (double vision), vertigo, and other problems associated with an inability to use the eyes in concert. Oculomotor Divergence reINtegration (ODIN) is a method to manipulate the field of view (FOV) for each eye independently to reconstruct an integrated POV rendering, tailor made for the user's needs.

Your Idea – Provide a high-level summary of your idea that includes a figure or flowchart.

What is the basic principle?

The FOV is manipulated digitally, based on inputs from both eyes, Head Mounted Video (HMV) positional information, and Eye tracking information. FOV is re-centered on the focus both eyes, so that a corrected Point of View (POV) is created. Basically, if one eye is crooked—this uncrooks the picture it sees.

How is it better than known solutions?

Current treatment for diplopia is with prism glasses. However, prism glasses are a fixed translation and do not deal with a partially or totally paralized condition. Using dynamic gaze information allows the correction to be constantly adjusted to bring both eyes a coherent image.

Provide a more detailed description of your invention, highlighting what is new

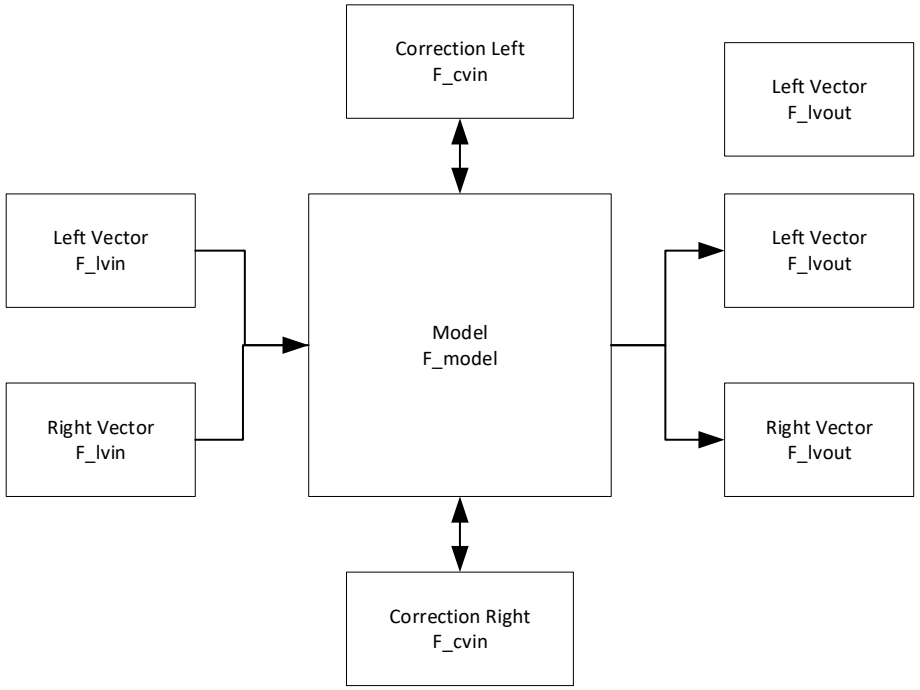
Which of our competitors use a similar idea?

How would we be able to determine if someone outside of Intel was using your idea?

To the best of your knowledge, identify any other pertinent information related to your idea

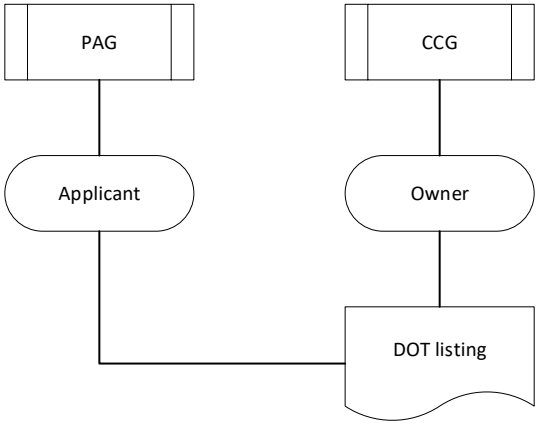
What is the value of your idea to Intel

To the best of your knowledge, identify any other pertinent information related to your idea



F_lvout = F_model(F_lvin, F_rvin)

F_rvout = F_model(F_lvin, F_rvin)


PAG
CCG
Applicant
Owner
DOT listing

BK

Murthy

Greg Bryant

Amir Faintuch

CCG

Praveen Vishakantaiah

Murali Veeramoney

Michael Uhl

Gopi Kolli

Shankar

John Valavi

PAG

Hussein

Kaye

Tim

Darius

Brad Smith

ITG

Daaman Hejmadi

Reynold D'Sa

Boyd Phelps

Ashish Giani

Bang Sutanto

Naveen Ramaswamy

SDG

Rory McInerney

Gloria Leong

Sujal Vora

Mukund Pai

MVE

Mohsen Fazlian

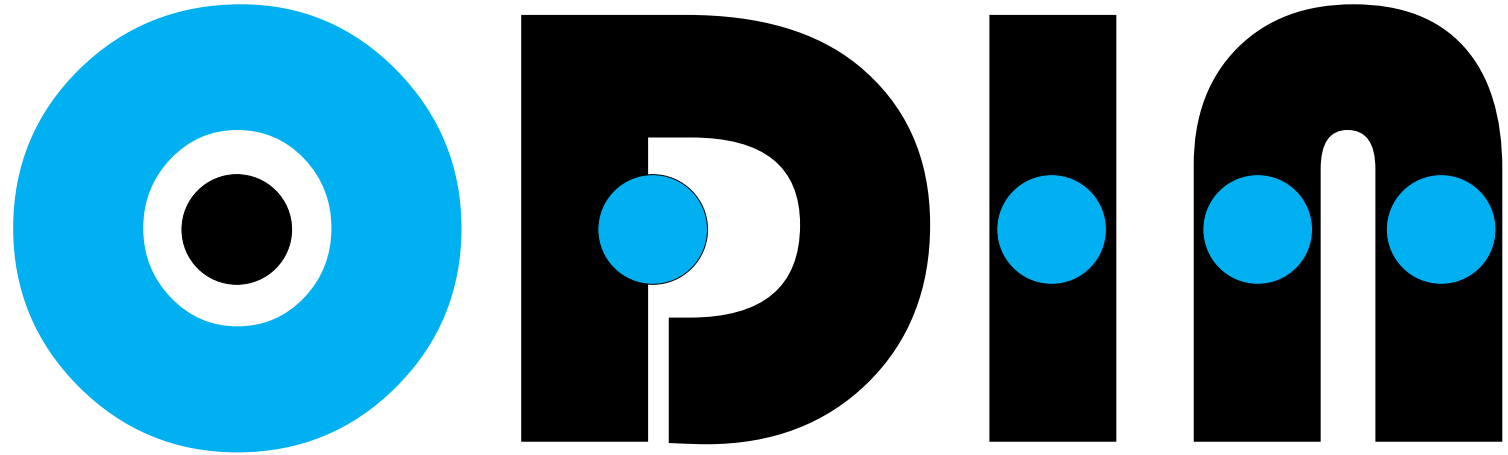
Jag Keshava

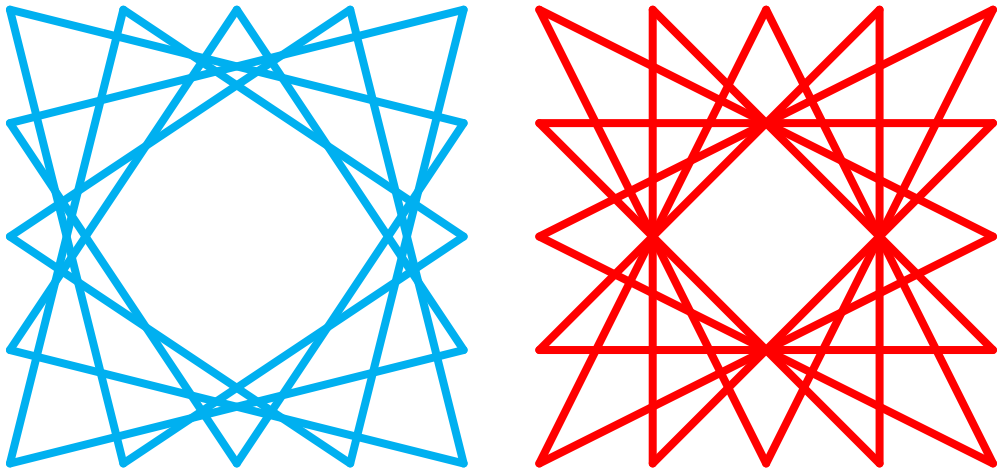
Bob Bock

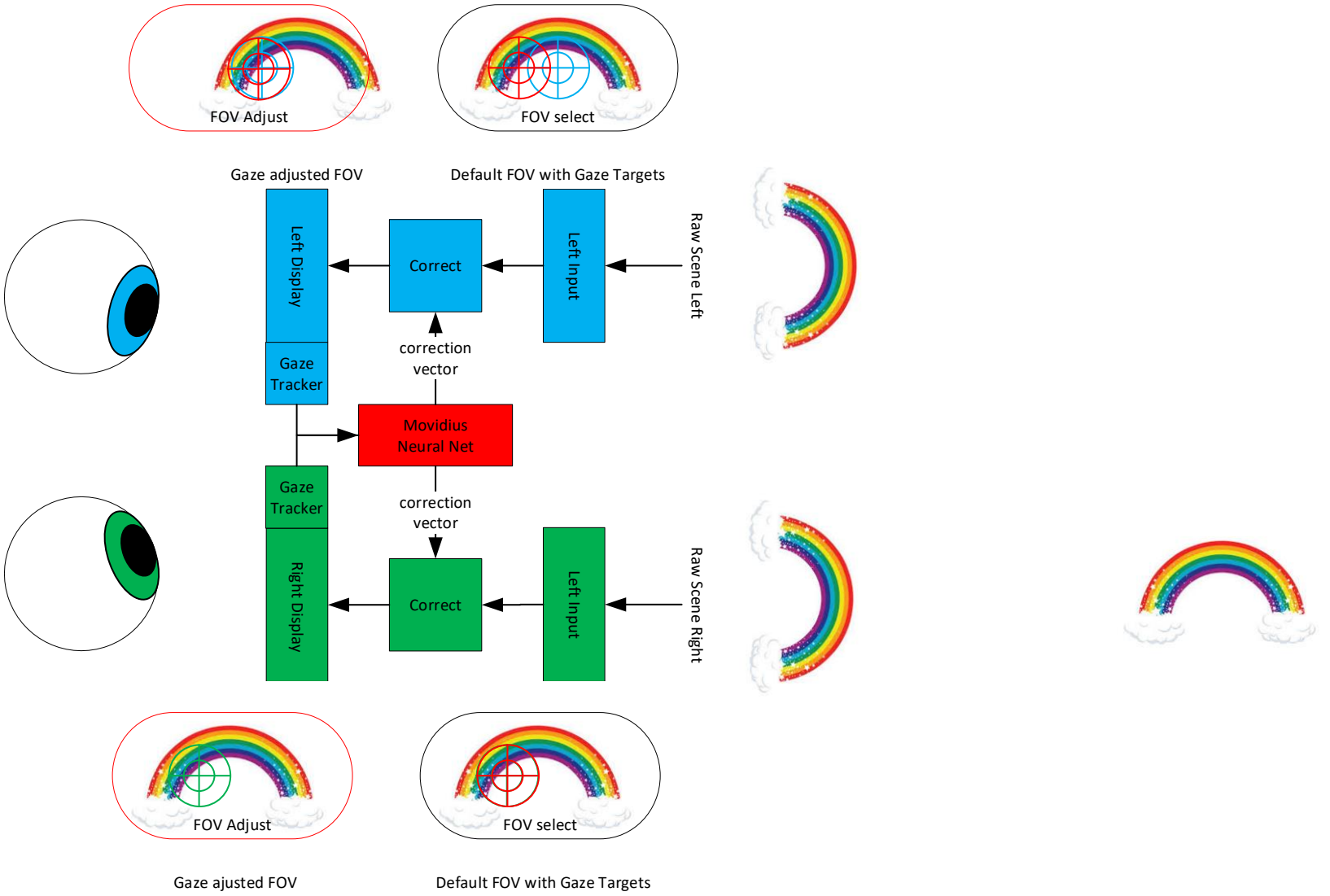
Rick Forand

Khalid Maklai

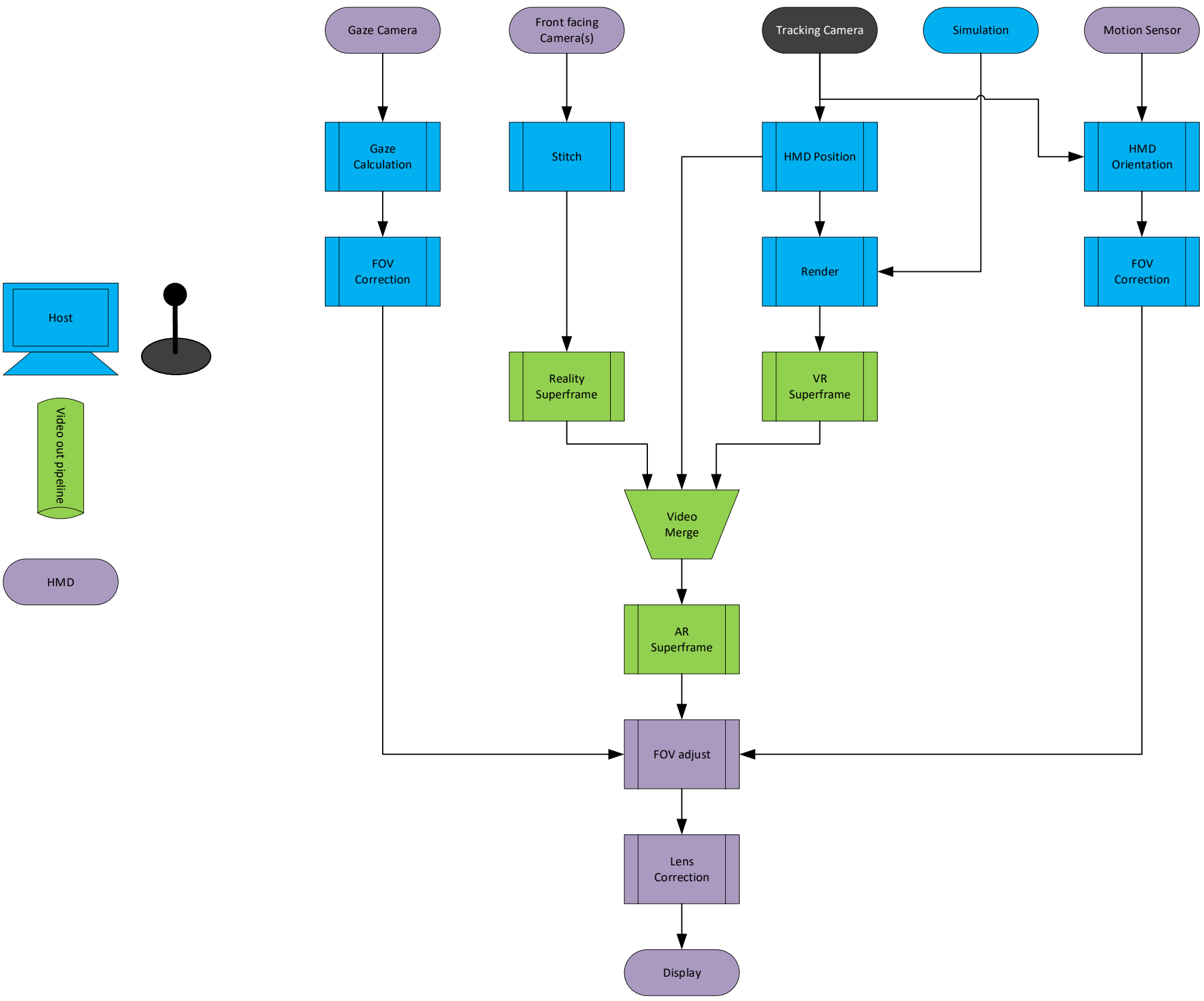
Sailesh Kotapalli

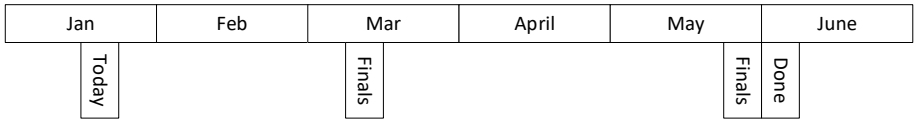

ODIN




FOV Adjust
FOV select
Gaze adjusted FOV
Default FOV with Gaze Targets
Left Display
Correct
Left Input
Raw Scene Left
correction vector
Gaze Tracker
Movidius Neural Net
Gaze Tracker
correction vector
Right Display
Correct
Left Input
Raw Scene Right
FOV Adjust
FOV select
Gaze ajusted FOV
Default FOV with Gaze Targets

		POC	Acceptable	Ideal	Oculus	VIVE	FOVE	VIVE 2
Display	**Display Tech**	LCD	OLED	Fast OLED	OLED	OLED	OLED	
	Refresh	60fps	90fps	120fps	90fps	90fps	90fps	
	Latency	100ms	25ms	5ms	10ms	10ms	10ms	
	Resolution	1080p	1440p	16k	1080p	1080p	1440p	
	Field of View	90	110	210	110	110	100	
Front facing Camera	**Camera Tech**	Single	Dual	Dual	None	CCA	None	
	Refresh	60fps	90fps	120fps	N/A	N/A	N/A	
	Latency	16ms	10ms	8ms	N/A	N/A	N/A	
	Resolution	1080p	1440p	8k	N/A	N/A	N/A	
	Angle of Coverage	120	140	240	N/A	N/A	N/A	
Gaze Tracking	**Gaze Tracking frequency**	30Hz	60Hz 120Hz	300Hz	N/A	N/A	120Hz	
	Gaze Tracking Latency	20ms	10ms	5ms	N/A	N/A	14ms	
	Gaze Tracking Resolution	640x480	1080p	8k	N/A	N/A	640x480?	
	FOV Adjustment	20ms	10ms	5ms	N/A	N/A	N/A	
Rendering Engine	**Motion to Render**	100ms	50ms	5ms	50ms	50ms	50ms	


Gaze Camera
Front facing Camera(s)
Tracking Camera
Simulation
Motion Sensor
Gaze Calculation
Stitch
HMD Position
HMD Orientation
FOV Correction
Render
FOV Correction
Host
Reality Superframe
VR Superframe
Video out pipeline
Video Merge
HMD
AR Superframe
FOV adjust
Lens Correction
Display



Opens

Dispose of Opens

Technical

ARs and next steps

Visual system review