



All Day Eye Tracking

AdHawk MindLink Sample Data

April 2021

Overview

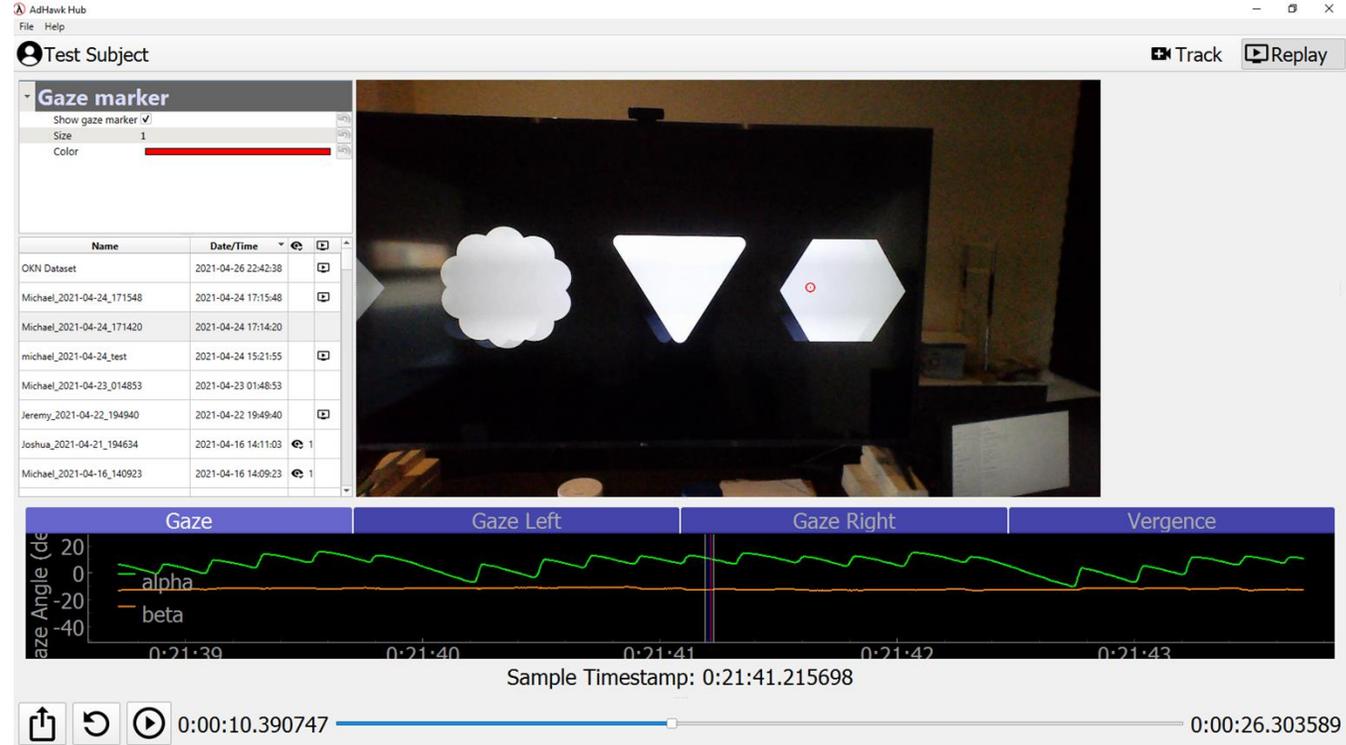
- Example Data recorded with the AdHawk MindLink glasses using the AdHawk Hub software
- **Note: this preliminary dataset was computed in the microcontroller that resides in the glasses – it is available in real-time (3ms latency). Improved data quality and higher sampling rates will be supported through the AdHawk Hub software when the MindLink glasses are shipped.**
- 2 sessions recorded at 250Hz
 - OKN
 - Validation
- Each Session contains:
 - *Gaze_data.csv* - Output eye tracking data in CSV format
 - *Meta_data.csv* - Meta data of the user as recorded in their profile (CSV)
 - *Session.mp4* - Session video recording
 - Exported video with overlay gaze dot
- Gaze_data CSV file is generated during each session recording
 - *Timestamp* – Data point timestamp
 - *Gaze X,Y,Z* - The binocular gaze (unit vector components) originating from the cyclopean eye
 - *Gaze Right X,Y,Z* - Right Eye Gaze Vector
 - *Gaze Left X,Y,Z* - Left Eye Gaze Vector
 - *Vergence* - Vergence in radians
 - *Screen X,Y* - The X,Y coordinates of the gaze dot within the world-camera video frame
 - *Frame_Index* - The video frame that corresponds to the eye tracking data.
 - Note that there are multiple gaze points in each frame of video.
 - All gaze points are drawn in each video frame in the example video.

Example Data

Timestamp	Gaze_X	Gaze_Y	Gaze_Z	Gaze_X_R	Gaze_Y_R	Gaze_Z_R	Gaze_X_L	Gaze_Y_L	Gaze_Z_L	Vergence	Screen_X	Screen_Y	Frame_Index
1290.825	0.221726	-0.16226	-0.96151	0.138142	-0.25881	-0.956	0.225342	-0.26551	-0.9374	0.099556	0.63904	0.441926	0
1290.829	0.221486	-0.16367	-0.96133	0.138142	-0.25881	-0.956	0.225342	-0.26551	-0.9374	0.097128	0.638849	0.443715	0
1290.833	0.222763	-0.16195	-0.96133	0.138142	-0.25881	-0.956	0.225342	-0.26551	-0.9374	0.094652	0.639816	0.441582	0
1290.837	0.222082	-0.16275	-0.96135	0.19764	-0.16017	-0.9671	0.248189	-0.16367	-0.95478	0.092192	0.639301	0.442573	0
1290.845	0.22153	-0.16261	-0.9615	0.198228	-0.16208	-0.96666	0.245124	-0.1631	-0.95567	0.087218	0.63889	0.442372	0
1290.849	0.221661	-0.16176	-0.96161	0.200232	-0.16065	-0.96649	0.243398	-0.16281	-0.95616	0.08487	0.638996	0.441287	0
1290.853	0.222265	-0.16163	-0.9615	0.202164	-0.16086	-0.96605	0.242675	-0.16235	-0.95643	0.082353	0.639447	0.441157	1
1290.857	0.222167	-0.16096	-0.96163	0.202875	-0.15933	-0.96616	0.241781	-0.16253	-0.95662	0.080032	0.63938	0.44029	1
1290.861	0.221801	-0.16049	-0.96179	0.202629	-0.15841	-0.96636	0.241303	-0.16251	-0.95675	0.077755	0.639111	0.439678	1
1290.865	0.221381	-0.15978	-0.96201	0.202274	-0.15736	-0.9666	0.240832	-0.16213	-0.95693	0.0756	0.638804	0.438749	1
1290.869	0.220578	-0.15927	-0.96228	0.20149	-0.15613	-0.96697	0.24002	-0.16236	-0.9571	0.073565	0.638209	0.438074	1
1290.873	0.219408	-0.1587	-0.96264	0.200602	-0.15514	-0.96731	0.238581	-0.16219	-0.95748	0.071671	0.637343	0.437286	1
1290.877	0.218189	-0.15809	-0.96302	0.199178	-0.15526	-0.96759	0.237579	-0.16085	-0.95796	0.069793	0.636441	0.436462	1
1290.881	0.217341	-0.15821	-0.96319	0.197641	-0.15609	-0.96777	0.237419	-0.16027	-0.95809	0.068205	0.635809	0.436583	1
1290.885	0.216181	-0.15873	-0.96336	0.196917	-0.15697	-0.96777	0.235813	-0.16043	-0.95846	0.066606	0.634941	0.437193	2
1290.889	0.214974	-0.15953	-0.9635	0.195334	-0.15868	-0.96781	0.23497	-0.16032	-0.95869	0.065183	0.634038	0.438156	2
1290.893	0.214598	-0.16001	-0.96351	0.194894	-0.15947	-0.96777	0.234649	-0.16049	-0.95874	0.063761	0.633755	0.438752	2
1290.897	0.213755	-0.16109	-0.96351	0.193345	-0.16132	-0.96778	0.234493	-0.1608	-0.95873	0.062578	0.63312	0.440087	2
1290.901	0.215973	-0.1606	-0.9631	0.197863	-0.16043	-0.96701	0.234418	-0.16071	-0.95876	0.061117	0.63477	0.439565	2
1290.905	0.215839	-0.16025	-0.96319	0.197928	-0.15904	-0.96723	0.234091	-0.1614	-0.95872	0.0598	0.634674	0.439105	2
1290.909	0.215914	-0.15988	-0.96323	0.19849	-0.15867	-0.96717	0.233687	-0.16103	-0.95888	0.058461	0.634733	0.438642	2
1290.913	0.215424	-0.15925	-0.96345	0.197749	-0.15746	-0.96752	0.233459	-0.16098	-0.95895	0.057189	0.634375	0.437823	2
1290.917	0.215022	-0.15835	-0.96369	0.19785	-0.15615	-0.96772	0.232571	-0.16049	-0.95925	0.056006	0.634084	0.436657	2
1290.921	0.214099	-0.15886	-0.96381	0.19614	-0.15705	-0.96792	0.232426	-0.1606	-0.95926	0.054943	0.633395	0.437262	2
1290.925	0.213815	-0.15871	-0.9639	0.196208	-0.15626	-0.96803	0.231795	-0.1611	-0.95933	0.05393	0.633186	0.437066	3
1290.929	0.212565	-0.15846	-0.96421	0.194357	-0.15597	-0.96845	0.23115	-0.16089	-0.95952	0.052985	0.632261	0.436696	3
1290.933	0.211897	-0.15822	-0.9644	0.193431	-0.15483	-0.96882	0.230746	-0.16155	-0.95951	0.052176	0.631769	0.436364	3
1290.937	0.211158	-0.1583	-0.96455	0.192032	-0.15472	-0.96912	0.230667	-0.16181	-0.95948	0.051463	0.631221	0.436432	3
1290.941	0.210973	-0.15762	-0.9647	0.191496	-0.15289	-0.96951	0.230846	-0.16227	-0.95936	0.05085	0.63109	0.435555	3
1290.945	0.210015	-0.15913	-0.96466	0.189773	-0.15558	-0.96942	0.230625	-0.16261	-0.95936	0.050323	0.630368	0.437434	3
1290.949	0.209799	-0.15986	-0.96459	0.189163	-0.15686	-0.96934	0.230791	-0.1628	-0.95929	0.0499	0.630203	0.438359	3
1290.953	0.210109	-0.16095	-0.96434	0.189521	-0.15805	-0.96907	0.231033	-0.16379	-0.95906	0.049481	0.630423	0.439757	4
1290.957	0.21042	-0.16234	-0.96404	0.189511	-0.16026	-0.96871	0.231636	-0.16437	-0.95882	0.049121	0.63064	0.441535	4
1290.961	0.211312	-0.16219	-0.96387	0.191199	-0.15932	-0.96853	0.231734	-0.165	-0.95868	0.048689	0.631302	0.44138	4

Optokinetic Response (OKN)

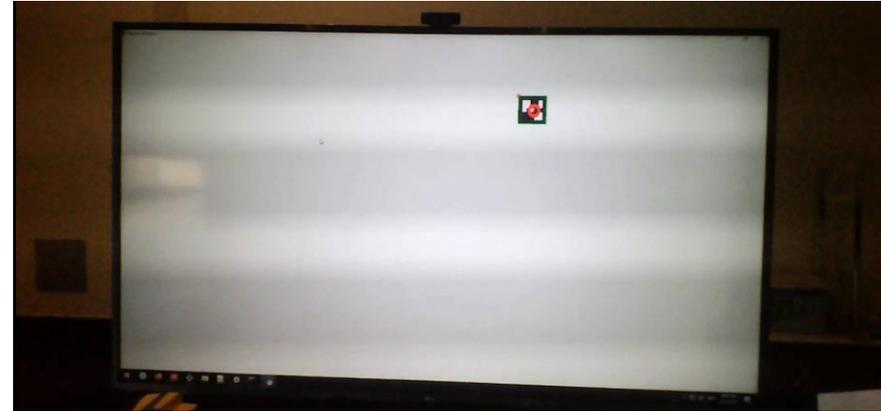
- User has calibrated on the same monitor that is now showing the stimuli
- User is being shown a stimulus intended to induce the Optokinetic Nystagmus reflex
- Session is recorded using AdHawk Hub and the AdHawk MindLink glasses
- Session can be replayed and gaze overlaid video can be exported using the AdHawk Hub



Validation

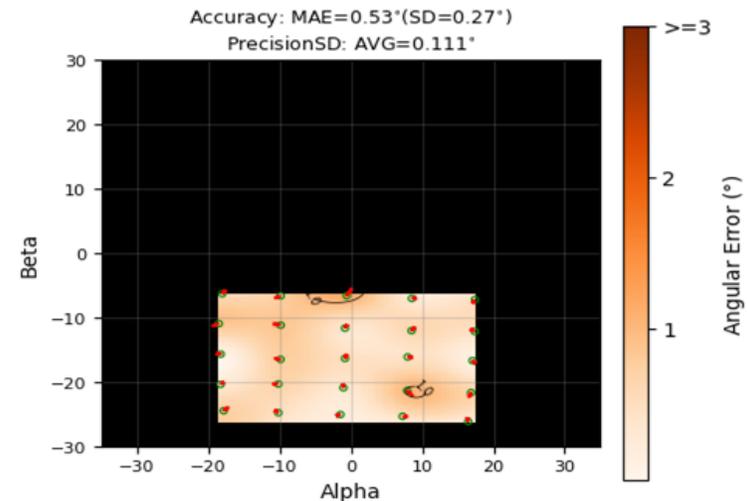
Validation Procedure

- This session recording shows an example of a 25 point marker based validation procedure
 - Calibration procedure is similar but only requires 1-9 points
- User is asked to look at the center of the marker and then a data point is collected



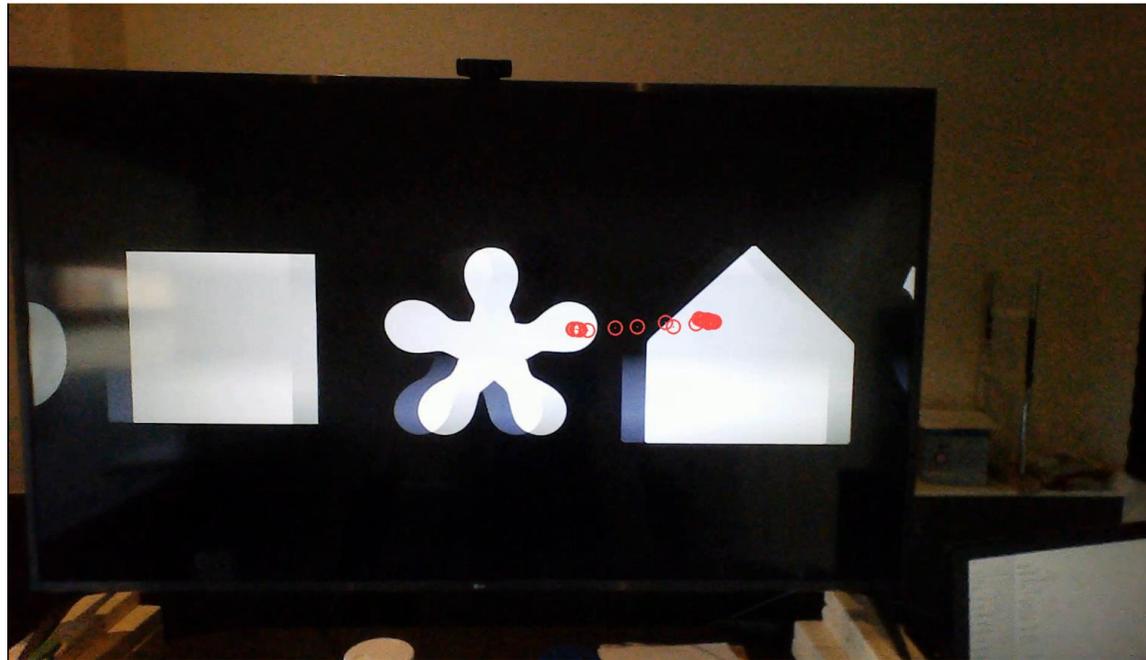
Mean Absolute Error Heatmap

- Marker detection gaze point is compared to the gaze reported by the system
- At the end of the procedure a Mean Absolute Error (MAE) score and heatmap is generated showing tracking performance across the calibrated tracking range



Exported Videos

- The recorded sessions can be exported via the AdHawk Hub application, which produces a video of the gaze dot overlaid on the world-camera stream
 - At faster tracking rates (over 30Hz), you will see multiple gaze data points drawn per frame, due to lower frame rate of the camera
 - The frame number from the front facing camera is recorded in the gaze_data.csv



Full Dataset

- If you are interested in downloading the full sessions referenced in this overview including the eye tracking data and accompanying videos, please click the following link:
 - <https://drive.google.com/file/d/1UOi8dWaONdWJzA3V-es6mRmcRivsQg0Y/view?usp=sharing>