

spatiotempDM pipeline info			
file name	info.	output data files	output figures
drosophila_reshapeSimulationsCell.m	Restructring of ABM simulation datasets. Reshapes each model simulation dataset (cell array) to real flies data structures.	Turndata_Short[DATATYPE_NAME(5:end)].mat	
drosophila_selectFlies.m	Initial preprocessing stage of fly data and ABM simulation data. Selects flies, defines edges, computes bounding polygons, omits inavlid trials and flies.	Turndata_[DATASET_NAME]_visInsp.mat Turndata_[DATASET_NAME]_edgesDef.mat poly360_Turndata_[DATASET_NAME].mat selectedFlies360DBTurndata_[DATASET_NAME].mat saved_yMinByFly360_[DATASET_NAME].mat	
yCorrectionExample.m	Illustrates trajectories normalization. Plots the noramlized bounding polygons in the short WT vs long WT datasets as well as the further correction required so that the short and long mazes size will reflect absolute proportions.		
drosophila_mainPreprocess.m	Main preprocessing stage of fly data and ABM simulation data. Normalizes trajectories, computes relative time in trial, determines turn decisions, excludes invalid trials.	output_drosophila_main_[DATASET_NAME].mat	
human_selectHumans.m	Initial preprocessing stage of human data. Defines edges, divides into turns, omits invalid trials and participants.	HumanTurndata_human_visInsp.mat Turndata_humanHuman.mat humanHuman_edgesDef.mat	
human_mainPreprocess.m	Main preprocessing stage of human data. Normalizes trajectories, computes relative time in trial, determines turn decisions, excludes invalid trials.	output_drosophila_main_HumanYy.mat	
drosophila_exampleFlyShort.m	Example fly illustrations. Plots raw and corrected trajectories, pdf(x) and TPI illustration for an example WT fly in the short maze.	saved_exampleFlyLoc.mat	Fig. 1B: exampleFly87__procTrajectories_YX.fig Fig. 1C: exampleFly87__correctedTrajectories_YX.fig Fig. 1D: exampleFly87__yBinEample_xPDF.fig Fig. 1D: exampleFly87__yBinEample_xDeltaPDF.fig Fig. 1E: exampleFly87__yBinEample_pRightGivenMedX.fig Fig. 1E: exampleFly87__TPIY.fig Fig. S1A: exampleFly87__TPIT.fig
drosophila_exampleBrownian.m	Plots raw and corrected trajectories for an example ABM agent.	saved_exampleBrownianLoc.mat	Fig. S14A: exampleBrownian1__procTrajectories_YX.fig Fig. S14B: exampleBrownian1__correctedTrajectories_YX.fig
drosophila_pdfYLastTransition.m	Computes and plots the probability density function of last midline-crossings, PDF(y last midline-crossing) across flies/agents or across trials in each datasets.	flies_PdfLastTrans.mat	Fig. S1C: flies_pdfLastTrans_Short.fig Figs. 1F, 4A, S3C (modify code for S3B), S13A: fliesAll_[COMPNAME] Comp_pdfLastTrans.fig Fig. 1G: fliesAll_[COMPNAME]Comp_pdfLastTransT.fig Fig. 3B: fliesAll_LongAlignComp_pdfLastTrans.fig
drosophila_speed.m	Plots avg. speed, distance and relative time by y-bins and relative time-bins for all flies in the short WT dataset.	flies_speed.mat	Fig. S1D: fliesShort_avg[PARAM_NAME]Y.fig Fig. S1E: fliesShort_avg[PARAM_NAME]T.fig
drosophila_normBoundingPolygon.m	Computes normalized and x-centered average bounding polygon across flies in dataset.	flies_boundPolProc_[DATASET_NAME(10:END-2)].mat	
drosophila_TPI.m	Spatial and temporal Turn Prdictiveness Index (TPI). Computes and plots TPI(y) and TPI(rel. trial time) of for all decision-makers in each data set.	flies_TPIs.mat	Figs. 1F, 1G, 4F, S11A: flies[DATATYPE(10:END-2)]_TPI[DOMAIN].fig Figs. 4A, S3C, S4A, S8A, S8A, S13A, S15B: fliesAll_[COMPNAME] Comp_TPI[DOMAIN].fig Figs. S6A, S15A: fliesAll_[COMPNAME]Comp_slopeTPI[DOMAIN].fig Figs. 3B: fliesAll_LongAlignComp_TPIy.fig Fig. S3B: fliesAll_LongAbsComp_TPIy.fig

drosophila_tsne.m	t-distributed stochastic neighbor embedding of behavioral data TPI. Dimensionality reduction (2D) of the individual TPI curves (within the bottom arm) of humans and all fly lines via t-distributed Stochastic Neighbor Embedding (t-SNE). With cosine distance metric.		Fig. 4G: flies_tSNE_TPI[DOMAIN].fig
drosophila_probEvenTransition.m	Quantifying local lateral tendencies via midline-crossings and pEven. Computes trial #midline-crossing in each maze region, typically post cul-de-sac, and the corresponding fractions of even #crossings, pEven. Plots #Crossings and pEven histogram and boxplots, comparison with Poisson predictions, pEven-based TPIs, and probability density kernal estimates of time spent in each maze region.	flies_pEvenTrans.mat	Figs. 2C, 3C, 3D: flies_pEvenTrans_hists_[DATASET].fig Figs. 2D, S3D, S11B: flies_pEvenTrans_extmTPI_[DATASET].fig Figs. S6D (S9A), S13D: flies_pEvenTrans_comp[COMPNAME]PEven.fig Figs. 4C (S9B), S13C: flies_pEvenTrans_comp[COMPNAME]PEven2.fig Figs. S6C, S13E: flies_pEvenTrans_comp[COMPNAME]Trans_[REGIONNAME].fig Fig. S15C: flies_pEvenTransPoisson.fig Fig. S1B: flies_histAvgTransBottomArm_Short.fig Figs. S3A, S6B: flies_pEvenTrans_TimeInRegion.fig
drosophila_wallFollowing.m	Quantifying global lateral tendencies using MAD scores. Computes flies' Median Absolute Deviation (MAD) around the horizontal (x) center during upward and/or downward motion in bottom arm. Plots MAD (x up the arm)-based comparison of TPI(y) and MAD datasets comparison.	output_drosophila_MADs.mat output_drosophila_MADs_order.mat	Figs. 2E (S2A), S3E, S11C: flies_MAD[DATASET]_BasedTPI_[DATATYPE(10:end-2)]_upArmWalk.fig Fig. 4B: flies_MADcenter_allShortsCompShortBox_upArmWalk.fig Fig. S13B: flies_MADcenter_allShortsCompModelBox_upArmWalk.fig
drosophila_wallFollowingByNumTrans.m	Quantifying short maze crossings-dependent global lateral tendencies and spatial TPI. Computes and plots MAD around the center as a function of #midline-crossings post-cul-de-sac. Computes and plots spatial TPI and estimates for TPI increase for trials with non-zero post-cul-de-sac crossings.	flies_TPIs_noZero.mat	Fig. 4B: flies_MAD_byTranNum_shortComp_upArmWalk.fig Fig. S9C: fliesAll_ShortComp_TPIY_noZeroTrans.fig Fig. S9D: fliesAll_ShortComp_slopeTPIY_noZeroTrans.fig
drosophila_longMazeTransAndSims.m	Long maze post cul-de-sac #midline-crossings and their simulations. Simulates the expected #crossings in shorter mazes or plots #crossings for example flies in the long maze.	simTransByItiDistY.mat	Fig. S5B-C: flies_bootTransByLongTrasIntervals.fig Fig. S5D: flies_bootTransByLongCONSECUTIVETrasIntervals.fig Fig. S5E: fliesLong_indivTransDist.fig
drosophila_quiverAvgs.m	Dataset average quiver plots and heatmaps. Computes and plots average quiver plots across flies in each fly dataset within the cul-de-sac, separately for left and right turns and motion towards or away from the cul-de-sac. Also computes and plot average quivers exclusively for zero post cul-de-sac midline-crossing trials for each fly dataset. Computes and plots average heatmaps across decision-makers, separately for left and right turns and the corresponding difference.	output_drosophila_Quivers.mat	Figs. 2A, 4D, S3F, S7: flies[DATA_NAME]_avgQuiver.fig Figs. 2B, S15D: flies[DATA_NAME]_avgHeat.fig Fig. S10: flies[DATA_NAME]_avgQuiverZeroTrans.fig
drosophila_quiverIndivs.m	Individual quiver plot demomnstration. Computes and plots a quiver plots of an individual example fly, for upward motion within the cul-de-sac, separately for left and right turns, alongside with trajectories from most visited 2D bin.	output_drosophila_main_[DATASET_NAME(10:END)].mat saved_exampleFlyLoc.mat	

GODM_TPI.m	<p>External dataset: Spatial TPI of flies in a circular arena. Computes and plots the trajectories and spatial TPI (Turn Predictiveness Index) of flies in the study of Sridhar and colleagues.</p> <p>Reference: Sridhar, V. H., Li, L., Gorbonos, D., Nagy, M., Schell, B. R., Sorochkin, T., Gov, N. S., & Couzin, I. D. (2021). The geometry of decision-making in individuals and collectives. Proceedings of the National Academy of Sciences of the United States of America, 118(50), e2102157118. https://doi.org/10.1073/pnas.2102157118</p> <p>TPIs are computed across all trials of all flies, separately for two conditions (with 2 targets each).</p>		Fig. S12: GODM_trajectoriesAndTpis_byTarAngles.fig
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FUNCTIONS

file name	info.		
customfuns/ySpeed.m	Kineamtics by spatial and temporal bins in the short WT dataset. Plots average speed, distance and relative time by y-bins and relative time-bins for all flies in the short WT dataset.		
customfuns/TPI.m	Computes the TPI - Turn Predictiveness Index - over spatial (Y) or temporal bins (T) for an individual decision-maker. Used for trajectory data that is not centered around the horizontal midline.		
customfuns/TPI1.m	Computes the TPI - Turn Predictiveness Index - over spatial (Y) or temporal bins (T) for an individual decision-maker. Used for trajectory data that is centered around the horizontal midline.		
customfuns/quiverGivenTurns.m	Computes a density-based quiver of a single fly, for a region of interest given by 2D grid.		
customfuns/myBinomTest.m	<p>External function. Performs a binomial test of the number of successes given a total number of outcomes and a probability of success.</p> <p>Reference: Matthew Nelson (2015). https://www.mathworks.com/matlabcentral/fileexchange/24813-mybinomtest-s-n-p-sided MATLAB Central File Exchange. Retrieved February 9, 2016.</p>		
customfuns/patchline.m	<p>External function. Efficiently plots lines as patches.</p> <p>Reference: Brett Shoelson (2023). https://www.mathworks.com/matlabcentral/fileexchange/36953-patchline MATLAB Central File Exchange. Retrieved September 18, 2023.</p>		
customfuns/circfit.m	<p>External function. Fits a circle in x,y plane.</p> <p>Reference: Izhak bucher (1991). Circle fit https://www.mathworks.com/matlabcentral/fileexchange/5557-circle-fit MATLAB Central File Exchange. Retrieved November 14, 2022.</p>		

customfuns/p_poly_dist.m	<p>External function. Computes distance from point to polygon.</p> <p>Reference: Michael Yoshpe (2008). Distance from points to polyline or polygon https://www.mathworks.com/matlabcentral/fileexchange/12744-distance-from-points-to-polyline-or-polygon MATLAB Central File Exchange. Retrieved November 8, 2022.</p>		
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