## **Real Time Crowd Navigation from First Principles of Probability Theory** Pete Trautman and Karankumar Patel

Honda Research Institute





The Necessity of Coupled Models



## $[\mathbf{f}^{R}, \mathbf{f}]^{*} = \operatorname*{argmax}_{\mathbf{f}^{R}, \mathbf{f}} p(\mathbf{f}^{R}, \mathbf{f} \mid \bar{\mathbf{z}}_{1:t})$ ${}^{\mathbf{f}^{R}, \mathbf{f}}_{u(t+1)} = \mathbf{f}^{R^{*}}(t+1)$

	$\mu(s)$	$\%_{s < 0.3}$	$\%_{s < 0.21}$	$\mu(d_r)$	$\%_{d_r/d_h > 1.25}$	$\max(d_r/d_h)$	$\mu(t)$	$\mu(\max(\rho))$
Human	$.89 \pm .1m$	5%	5%	$25.6 \pm 6.2m$	NA	NA	NA	.22±.15
IGP_Full	$.55 \pm .17m$	15%	8%	$22.6\pm5.6m$	3%	1.4	$.2 \pm .3s$	$.23 \pm .12$
IGP_Diag	$.57 \pm .2m$	30%	16%	$25.0\pm5.8m$	0%	1.2	$.11 \pm .07s$	$.43 \pm .4$
IGP_Lin	$.55 \pm .2m$	26%	15%	$26.3\pm6.5m$	16%	1.4	$.12 \pm .1s$	$.46 \pm .9$
DWA	$.4 \pm .15m$	50%	32%	$31.9\pm8.3m$	44%	2.2	$.1 \pm .03s$	$.23 \pm .1$
MC_1e5	$.4 \pm .17m$	47%	31%	$32.7\pm8.6m$	57%	2.1	$4.7 \pm 3.2s$	$.2 \pm .3$
SARL*	$.36 \pm .12m$	47%	25%	$8.9\pm2.7m$	0%	1.23	$1.4 \pm .2s$	$.17 \pm .1$