Misjudging the Machine: Gaze May Forecast Human-Machine Team Performance in Surgery

Sue Min Cho, Russell H. Taylor, and Mathias Unberath

Johns Hopkins University, Baltimore MD, USA
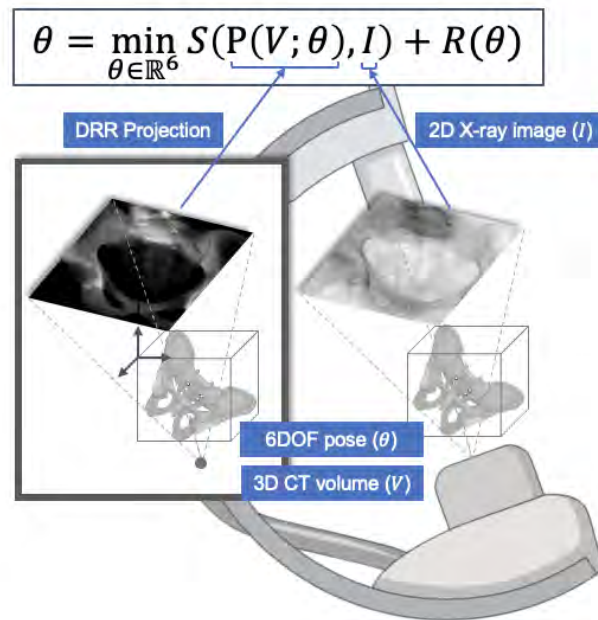{scho72, rht, unberath}@jhu.edu

Fig. 1: An illustration of single-view, single-object 2D/3D registration. The goal is to find the pose of the volume, $\theta \in \mathbb{R}^6$, with respect to the projective imaging geometry, given a 3D CT (V) and a 2D X-ray (I) are provided. $\mathcal{P}$ is a projection operator that generates images from V, $\mathcal{S}$ is a similarity measure that compares the generated and observed X-ray images, and $\mathcal{R}$ is a regularization term.

Table 1: Statistical Analysis of Gaze Metrics in Relation to Assessment Error

Model	Gaze Metric	Coefficient	SE	p-value
1	Fixation Count	-0.219	0.091	0.016**
2	Fixation Duration	-0.220	0.096	0.022**
3	Stationary Gaze Entropy	-0.074	0.060	$0.216^{n.s}$
4	Gaze Transition Entropy	0.007	0.093	$0.943^{n.s}$

$^{n.s}$ not significant, *$p < 0.05$, **$p < 0.01$, *** $p < 0.001$

Table 2: Statistical Analysis of the Effect of Visualization Paradigms on Various Gaze Metrics

Model	Gaze Metric	Coefficient	SE	p-value
1	**Fixation Count**			
	Intercept	0.173	0.059	0.003**
	Paradigm 2 vs. 1	0.054	0.020	0.007**
	Paradigm 3 vs. 1	0.050	0.020	0.013*
2	**Fixation Duration**			
	Intercept	0.183	0.070	0.010*
	Paradigm 2 vs. 1	0.067	0.017	<0.001***
	Paradigm 3 vs. 1	0.053	0.017	0.002**
3	**Stationary Gaze Entropy**			
	Intercept	0.559	0.037	<0.001***
	Paradigm 2 vs. 1	0.054	0.021	0.012*
	Paradigm 3 vs. 1	0.031	0.021	$0.147^{n.s}$
4	**Gaze Transition Entropy**			
	Intercept	0.173	0.026	<0.001***
	Paradigm 2 vs. 1	0.054	0.017	0.001**
	Paradigm 3 vs. 1	0.012	0.017	$0.466^{n.s}$

$^{n.s}$ not significant, *$p < 0.05$, **$p < 0.01$, *** $p < 0.001$