Let's begin by going over some of the nomenclature from the generalized S-W paper to make sure we've defined all our terms and extensions very clearly:

Variable	Range/Conditions	Name	Description
I_t		RGB-D Image at time t	This represents the stream of images to be segmented
$G < V, E >$	$V = v_1, v_2, \ldots, v_N$	A Graph containing vertices V and edges E	This is the general structure we will use to encode adjacency relationships within an Image I
$\pi_n = (V_1, V_2, \ldots, V_n)$	$\bigcup_{i=1}^n V_i = V$ $V_i \bigcap V_j = \emptyset, \forall i \neq j$	A partition with n segments	A partition is an assignment of each edge E in graph G' to either "on" or "off". An atomic region must exist uniquely in a segment.
$l \in L$	L={planar, cylindrical, spherical, spline, etc.}	The model family for a region	The model family refers to what sort of surface we think a region contains, e.g. plane, sphere, spline, etc. For the time being, this is assumed to be planar for all regions.
θ_i	$i = 1, 2, \ldots, n$	The model parameters for a region	These are the coefficients for the given model type. For the plane model, these are the coefficients from the plane equation $ax + by + cz = d$.
$c_i = (l_i, \theta_i)$	$i = 1, 2, \ldots, n$	The full model for a region	Combination of family and parameters. Eventually, we would like to explore these variables as well, using Data-Driven MCMC
$W = (n, \pi_n, c_1, c_2, \ldots, c_n)$		The full world description	This is the function we are trying to optimize via $W^* = \text{argmax}_{W \in \Omega} P(I\|W)P(W)$. For our problem, the search space Ω is very large, with $\Omega = \bigcup_{n=1}^{\|V\|} \{\Omega_{\pi_n} \times \Omega_l^n \times \Omega_{\theta_1} \times \Omega_{\theta_2}, \ldots, \times \Omega_{\theta_n}\}$
G_t		The adjacency graph for the image at time t	
G'_t		The world graph incorporating all images up to time t	
$V'_t = V'_{t-1} \bigcup V_t$		Set of vertices at time t t	
$E'_t = E'_{t-1} \bigcup E_t \bigcup E(c'_i, c_j)$	$i = 1, 2, \ldots, \sum_{\tau=1}^{t-1} N_\tau$ $j = 1, 2, \ldots, N_t$	Set of edges at time t	
$q_e = P(\mu_e = on\|c_i, c_j)$	$e \in E$	Discriminative probability on edge e.	μ_e is a binary random variable following a Bernoulli distribution and describing the probability of two adjacent vertices in $G'_0(t)$ being connected in a given step.
$E'_t(\pi) \subset E'_t$		Set of edges turned on for partition π at time t	