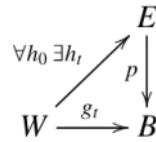


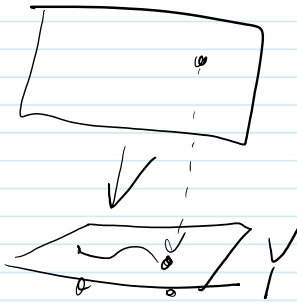
Homotopy fibers and framed knots

November 7, 2018 8:48 PM

(150609d) Fibrations $p: E \rightarrow B$ on right. Any $X \xrightarrow{\phi} Y$ is $X \xrightarrow{i_0} E_\phi \xrightarrow{p_1} Y$ with i_0 a homotopy equivalence and p_1 a fibration. Here $E_\phi \sim \{(x \in X, \gamma: [0, 1] \rightarrow Y): \gamma(0) = \phi(x)\}$



$$p_1(x, \gamma) = \gamma(1)$$



$$p_1^{-1}(y) = \{(x, \gamma): \gamma(0) = \phi(x), \gamma(1) = y\}$$

Example: $\text{Emb}(\mathbb{R} \hookrightarrow \mathbb{R}^3) \hookrightarrow \text{Imm}(\mathbb{R} \rightarrow \mathbb{R}^3)$

The homotopy fiber is

"an embedding, along with a path in immersions to the unknot"

= a framed knot

Q. What other "framings" arise in this way?

of 3-manifolds?

of w-knots?

of v-knots?