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Marked hyperbolic surfaces

Definition. Category of marked hyperbolic surfaces

Let S be a smooth 2-manifold (without boundary). Then

$$\mathbb{R}H^2\text{-Riemh}(S)$$

denotes the category where

- objects** are *marked hyperbolic structures on S* , that is, they are diffeomorphisms

$$\underbrace{(X, g_X)}_{\text{complete hyperbolic 2-manifold}} \xrightarrow{\Phi} S$$

- morphisms** are isometric embeddings which are homotopic

Then

$$\mathbb{R}H^2\text{-Riemh}(S)_{\cong}$$

is the set of all *marked hyperbolic structures* upto homotopic isometries.

$$\mathbb{R}H^2\text{-Riemh}(S)_{\cong} \leftrightarrow \left\{ \Gamma \leq PSL(2)(\mathbb{R}) \text{ discrete} \middle| \Gamma \backslash \mathbb{R}H^2 \cong_{\text{Man}} S \right\} / PGL(2)(\mathbb{R})$$

$$\text{Manh}_{\mathbb{C}}(S)_{\cong} \leftrightarrow \left\{ \Gamma \leq PSL(2)(\mathbb{R}) \text{ discrete} \middle| \Gamma \backslash \mathbb{R}H^2 \cong_{\text{Man}} S \right\} / PSL(2)(\mathbb{R})$$

$$\mathbb{R}H^2\text{-Riemh}(S)_{\cong} \longleftrightarrow \left\{ \Gamma \leq PSL(2)(\mathbb{R}) \text{ discrete} \middle| \Gamma \backslash \mathbb{R}H^2 \cong_{\text{Man}} S \right\} / PGL(2)(\mathbb{R})$$

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And it has 17 siblings.

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