Generating Non-Stationary Gaussian Processes on Curved Domains

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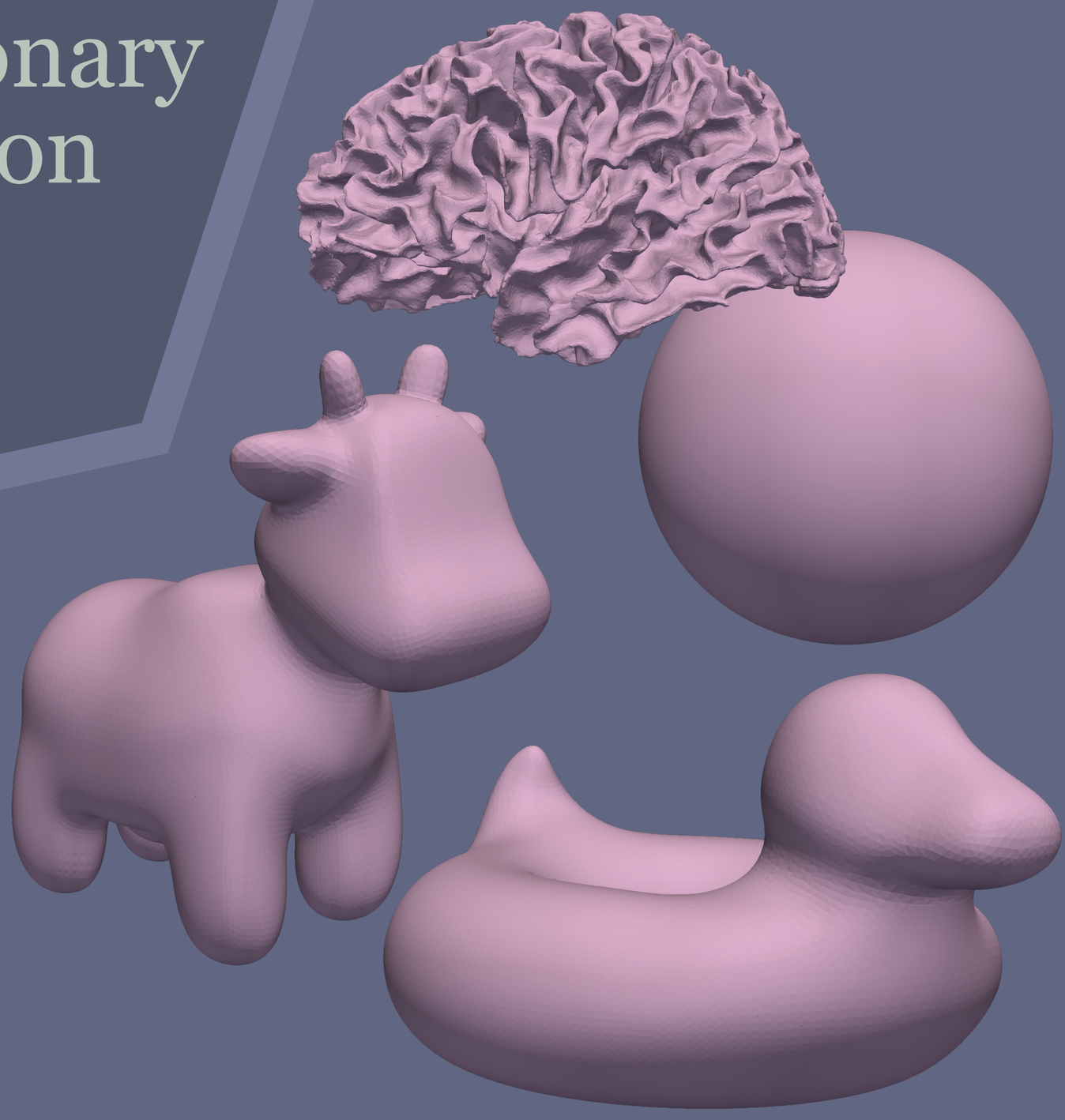


Color white noise on a surface by

$$\mathcal{Z} = \gamma(\mathcal{L})\mathcal{W}$$

Math details

The surface is meshed

FEM used to solve PDE

$\mathcal{W}$ denotes white noise

$\gamma\colon \mathbb{R}^+ \to \mathbb{R}^+$

Sets smoothness of GP

$\mathcal{L}u(x) = \nabla_{\mathcal{M}} \cdot (\mathcal{D}(x) \nabla_{\mathcal{M}} u(x)) + V(x)u(x)$

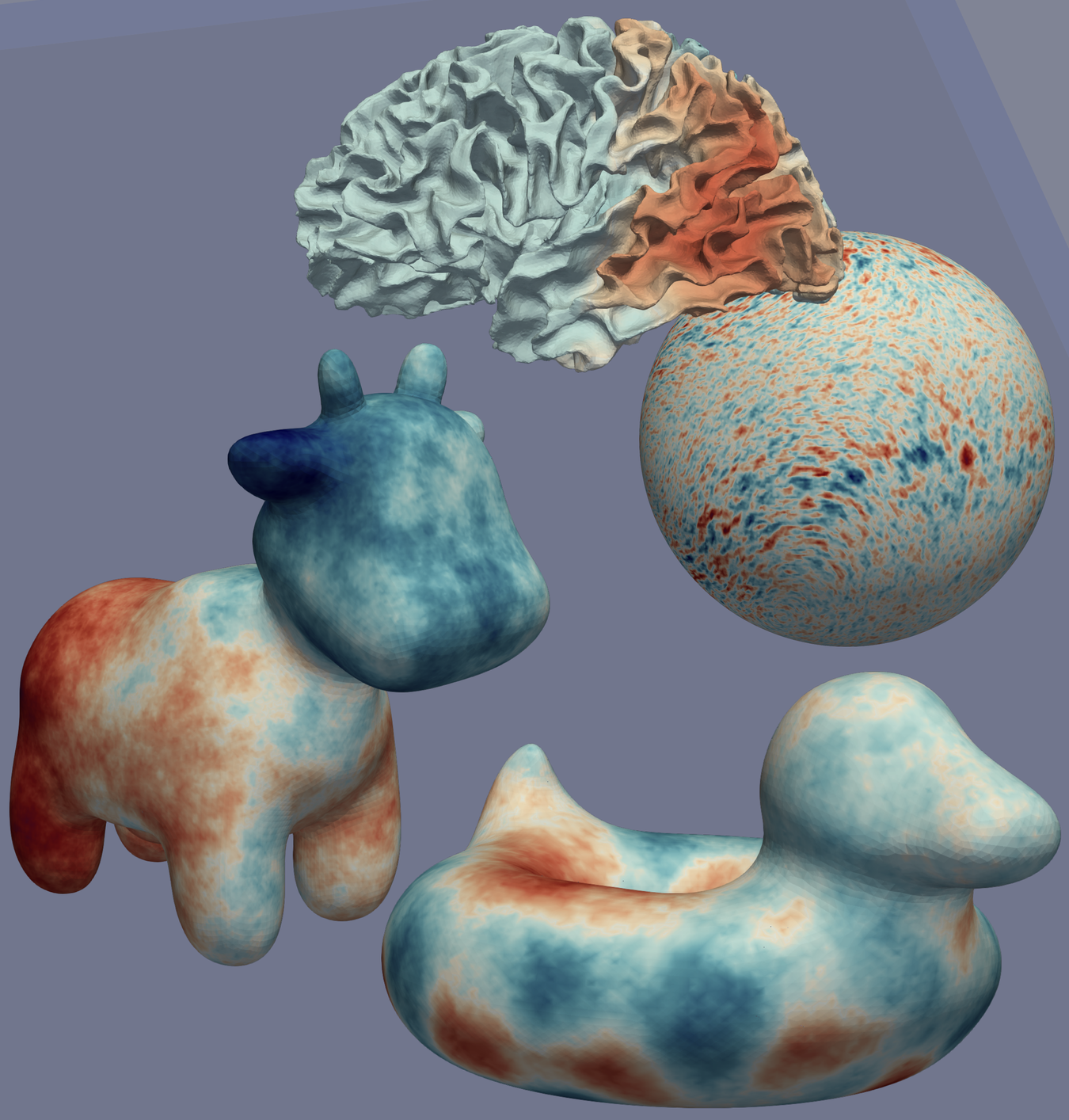
Reaction-diffusion operator

$\mathcal{D}(x)\colon T_x\mathcal{M} \mapsto T_x\mathcal{M}$

Determines preferred directions

$V\colon \mathcal{M} \to \mathbb{R}$

Determines local correlation length



A large variety of fields is obtained

Our contribution

- Sampling algorithm
- Strong error bounds
- Fast code

Remaining work

- Inference problem
- Time-dependence
- Weak error

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