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This note, that was found here, as a part of a collection
is written (completely with human hands) by Rupadarshi Ray,
was created on February 15, 2025 9:26:36 PM,
was last modified on May 17, 2026 7:36:50 PM, and
was exported on September 7, 2026 3:31:19 PM.

Parallel transport on a curve in a semi-Riemannian manifold

Definition. Parallel vector or tensor fields along curves

Let (M, ∇) be a smooth manifold with a connection on its tangent bundle. A smooth vector or tensor field

$$V \in \mathbf{\Gamma T}^{r,s} T_\gamma M$$

along a smooth curve

$$\gamma : I \to M$$

is said to be **parallel along** γ (with respect to ∇) if

$$\nabla_{\dot\gamma} V \equiv 0$$

Locally, along a curve

$$x(\gamma((t)) = (\gamma_1(t), \dots, \gamma_n(t))$$

and vector field

$$V(t) = \sum_{i=1}^{n} V_i(t) \frac{\partial}{\partial x_i}$$

is *parallel* $\iff$

$$(\nabla_{\dot\gamma} V)_k = \dot V_k + \sum_{i,j} \Gamma_{ij}^k V_j \dot\gamma_i = 0$$

for all components $1 \le k \le n$.

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  - manifolds
    - $\mathbb{R}$-manifold semi-Riemannian
      - Parallel transport on a curve in a semi-Riemannian manifold

And it has 18 siblings.

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