We present an approach for highly accurate 3D object reconstruction with RGB-D sensors. The camera motion is tracked frame-to-frame in real-time via a novel direct implicit-to-implicit scheme between pairs of signed distance fields (SDFs), whereby expensive correspondence search is avoided. Our energy formulation further allows for incorporation of photometric and surface orientation constraints. We achieve more precise trajectory estimates and higher quality 3D models than related methods.

**Advantages**
- Extremely accurate
- Fully automatic
- Real-time
- Generic motion
- Generic geometry and texture

**Related Work**
- KinectFusion [6]: frame-to-model point-plane ICP tracking
- global model as weighted average [3] of TSDFs
- Point-to-Implicit [1,2]: frame-to-model projection of point cloud onto global TSDF
- Limitations:
  - ICP constrained to regular motion, not robust to gross outliers
  - cannot remedy large error accumulation in the global model

**References**
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(5) Mesoudi, T.: Registration and Integration of Multiple Range Images by Matching Signed Distance Fields for Object Shape Modeling (CVIU 2002)