Rough notes about the exponential of an SVF
TO-DO lists

Some notes on the numerical computation of the exponential of a stationary velocity field.

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TODO list

1. Validate numerical methods for the computation of the exp measuring the inverse consistency.
2. Build "ground truth" from SVF generated with ADNII database with up sampling integrate with Euler scheme and down sampling afterwards. Compare these to the one computed with other methods in the original space.
3. Begin a collection of examples of stationary ode, where the closed analytical form is available. So we have ground truth in less straightforward situation than SE(2).
4. Extend the closed form integrator to all of the possible linear case (not only SE(2))
5. series method and accelerating convergence series.
6. Look for a ground truth for small-curled vector fields.
7. Explore the geometrical integrators.
8. discuss about the shifted exponential function for the integration scheme: [2] pag. 2 and [1].
9. Explore other scaling and squaring flow-integrators.

TODO list code

1. Test exp code, each numerical method, once there is some ground example.
2. Integrate algorithm for the computation of the Logarithm (ISS or Bossa or some other things will come).
3. Speed, computational complexity: refactor the code so to have better operations for the multiplication and scalar multiplication that are correctly inherited in the new object. (requires some more tests and refactoring of the sfv methods class!)

References

[1] Nicholas J Higham and Lin Lijing. Matrix functions: A short course. 2013.

[2] Marlis Hochbruck, Christian Lubich, and Hubert Selhofer. Exponential integrators for large systems of differential equations. *SIAM Journal on Scientific Computing*, 19(5):1552–1574, 1998.