

HAAG Weekly Report Week 3

Steve Foryoung

sforyoung@gatech.edu

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Time-Log

- What did you do this week?
 - Setup and attended meeting with Dr. Porto
 - Setup Planner update protocols for the 3-d Modelling Team.
 - Reviewed development files shared by Dr. Porto.
 - Read Anthony Gatti Paper on Coherent Point Drift and Numpy Implementation.
- What are you going to do next week
 - Setup Repository with data provided by Dr. Porto.
 - Test current implementation of the CPD as requested by Dr. Porto
 - Read research Document on Bayesian Extensions and Geodesic Kernels on CPD.
 - Begin investigations on statistical shape model
 - Create slides for meetings with Computation Advisors and Dr. Porto.
- Blockers, things you want to flag, problems, etc.
 - Currently trying to figure out a way of finding the most relevant papers on subject matter.

Abstracts

Gatti & Khallaghi, PyCPD: Pure Numpy Implementation of the Coherent Point Drift Algorithm. Journal of Open Source Software, 2022.

<https://joss.theoj.org/papers/10.21105/joss.04681>

The PyCPD package implements the CPD algorithm in NumPy. The library itself includes a module to implement the Expectation Maximization (EM) algorithm. Sub-modules inherit the EM functionality and implement rigid, affine, and deformable registration using EM. CPD registration using affine, rigid, and deformable methods all allow for the transformation learned from CPD to be applied to any point cloud. Thus, it is possible to learn the transformation on a subset of the points and then apply it to the whole point cloud to reduce computation time. Finally, the low-rank approximation for deformable registration that was described by Myronenko and Song (Myronenko & Song, 2010) was implemented. A low rank approximation

of the Gaussian kernel is used to reduce computation time and has the added benefit of regularizing the non-rigid deformation.

What did you do and prove it

Links to papers read: <https://joss.theoj.org/papers/10.21105/joss.04681>

Dr. Porto Dropbox files:

<https://www.dropbox.com/scl/fo/kg25ex3eicgctu473v5p8/AFi6bOc29go6oCcD1QCkbko?rlkey=v37u80ooihwhzz75mqgcwxl3t&e=1&dl=0>

Slack link for planner coordination: <https://humanaugmente-e7j6563.slack.com/archives/C08990A405C/p1737512060989549>