Annotated Bibliography

Object Tracking

Kevin Andrade

Binghamton University

The partial least squares algorithm(PLS), when compared to other algorithms such as the multiple instance learning algorithm(MIL) does a much better job at tracking objects in difficult visual scenarios, while improving the effectiveness of security and surveillance cameras, human-phone interaction, medical imaging, and traffic control.

Philip, R. C., Ram, S., Gao, X., & Rodriguez, J. J. (2014, April). *A comparison of tracking algorithm performance for objects in wide area imagery.* 2014 Southwest Symposium on Image Analysis and Interpretation, San Diego, California, USA. doi:[10.1109/SSIAI.2014.6806041](https://doi.org/10.1109/SSIAI.2014.6806041)

There are numerous algorithms to track objects, but some perform better than others. Rohit C. Philip, Sundaresh Ram, Xin gao, explain that tracking objects in video depends on several factors, such as the quantity and shapes, and the prior knowledge of the objects. The authors state that it’s challenging to track small objects on low resolution images. They compare 6 different algorithms to see which one performs the best under difficult visual scenarios, such as, occlusion handling, negligible motion, background clutter, and low contrast. The difficult visual scenarios were replicated with an Arial view of traffic, creating different scenarios. At the end of the tests, it is concluded, when presented with different levels of visual difficulty, the PLS algorithm is the best overall or has similar performance, compared to the other 5.

# Rohit C. Philip, Sundaresh Ram, Xin Gao are graduates from the University of Arizona, obtaining their PHD degree in Electrical & Computer Engineering. Their background knowledge has lead them to write many peer reviewed publications with the current one being published in the 2014 Southwest Symposium on Image Analysis and Interpretation, an IEEE source, being published in May 2014. The authors used many references to other peer reviewed sources, most of them being part of the IEEE website itself. The references and their studies helped make an objective claim by showing evidence with their recorded results. My thesis will be elaborated with the results of the PLS algorithm when compared to other algorithms such as the MIL algorithm.

# Wang, Q., Chen, F., Xu, W., & Yang, M. (June 2012). Object tracking via partial least squares analysis*. IEEE Transactions on Image Processin*g, *21*, 4454-4465. doi: 10.1109/TIP.2012.2205700

The authors talk about a few positive and negative features of the particle least squares algorithm. The author describes the technical aspects of the statistical PLS algorithm, such as, the mathematical formulas for the object analysis, the learning of the object’s appearance using PLS analysis, the connection to other algorithms, recognizing an object with appearance models, and the adaptation of backgrounds. The PLS algorithm is put into numerous tests with different visual scenarios to determine its strengths, such as the tracking of moving cars, low light person tracking, and blurry person tracking. The results show the accuracy of the PLS algorithm tracking.

The authors Qing Wang, Feng Chen, Wenli Xu, and Ming-Hsuan Yang all have previous publications. They have all graduated college, with a mix of B.S, M.S, and PHD degrees. Qing Wang, Fen Chen, Wenli Xu, are from china, while Ming-Hsuan Yang is from the USA; Everyone has an interest in computer vision, this enforces the credibility on the source. They have many referenced annotations, with a lot of facts and objective points. The article was published recently in June of 2012 in the IEEE Transactions on image processing issue, with a vast amount of details of the PLS algorithm. The technical aspect of the PLS algorithm and how it works with human tracking can elaborate my thesis and paper supporting the ability to track from video surveillance cameras, human- phone interaction tracking, and traffic control cameras.

Metaxas, D. N. (February 2005). Introduction. *Communications of the ACM*, *48*, 26-29. doi: [10.1145/1042091.1042115](http://dx.doi.org.proxy.binghamton.edu/10.1145/1042091.1042115)

Dimitris Metaxas talks about the importance of image modeling and analysis to the medical field. The author describes some of the complexities of the ability to analyze and track an organ due to its shape/structure, and the motion due to the noise and nonlinearities. New tools must be created for medical image analysist so that it can handle functions such as organ segmentation, reconstruction of 3d organ geometry and motion, disease diagnosis, surgical planning, and education. Ways that the human body is examined become more advanced and sophisticated with the rapid advancements of technology. With the help of algorithms and modeling, new 3d structures can be made from a patient’s organs to further and better examine.

Dimitris Metaxas is the director of CBIM center (Computational Biomedicine, Imaging, and Modeling Center), and the curriculum chair of computer science and a professor at Rutgers School of Arts and Sciences. He has received several patents for his amazing work related to medical imaging. Dimitri’s extensive background knowledge and having his work be published in the magazine of Communications of the ACM in 2005 makes his work a reliable source of information. The information is objective by showing the impacts of computing technology in the medical field. The impacts of medical imaging will be a great addition to my thesis by providing examples on how object tracking plays part into a bigger picture by aiding the reproduction of 3d simulated organs and medical advancements.

Yun, W., Cho, Y., Kim, D., Lee, J., Yoon, Hosub., & Kim, J. (2013, August). *Robotic person- tracking with modified multiple instance learning*. 2013 IEEE RO- MAN, Gyeongju, South Korea. doi:10.1109/ROMAN.2013.6628445

The author talks about the importance of human tracking from the point of view of a robot, typically it requires a lot of processing power for this to be able to happen, but with a modified version of the MIL tracking algorithm it is possible to simplify this process. The author explains some of the basic problems of the MIL algorithm, such as low quality video, fast and abrupt changes, background clutter, low frame rate (due to any complications of person tracking). The modified version of the MIL algorithm is explained deeply and thoroughly with many diagrams and algebraic expressions. The algorithm is put into many tests with some outstanding positive results.

Woo-Han Yun, Young-Jo Cho, Dohyung Kim, Jaeyeon Lee, Hosub Yoon, and Jaehong Kim have been contributors to many other peer reviewed sources. Most of their sources relate to vision tracking algorithms, increasing the validity of their work. They are from china with degrees in Computer engineering. Their journal was published in the IEEE RO-MAN issue on August 2013. The detail and the citations that they put in into their work validates it a credible and reliable source. My thesis can be further elaborated by showing the variations of the MIL algorithm and how it can be a valuable tool for robot – human tracking.

Connecticut Children’s Office. (2017). About motion analysis. Retrieved from <https://www.connecticutchildrens.org/orthopedics-center-for-motion-analysis/what-is-> motion-analysis/

The Connecticut Children’s Medical Center has a center that specializes in motion analysis, studying the analysis of your body and determine medical outcomes based on the gathered data. The Connecticut Children’s Medical Center describes the different types of analysis that they provide, such as, clinical exams, kinematics exams, electromyography exams, foot pressure exams, and video exams. The medical center describes the procedure of their exams with video exams and electromyography exams relying heavily on object tracking software.

The Connecticut Children’s Medical Center is the only hospital dedicated exclusively to the care of children. They are a non-profit organization with a staff of over 1000. The medical center has a teaching partnership with Frank H. Netter MD School of Medicine at Quinnipiac University and is a research partner of Jackson Laboratory. They are constantly looking for ways to enhance their practices and they are a national leader in community-based prevention and wellness programs. With the overview of their practices and their technical advancements, it is shown that object tracking plays a huge part in the analyzation of the human body. The information provided is sufficient to further enhance my paper in the community aspect.