

A Tool for Geospatial Analysis of Physical Activity: Physical Activity Location Measurement System (Palms)

Patrick, K.,¹ Kerr, J.,^{1,2} Norman, G.,¹ Ryan, S.,³ Sallis, J.,² Krueger, I.,⁴ Griswold, W.,⁴ Rios, P.,⁴ Deitrich, S.,⁴ Raab, F.¹, Lotspeich, D.,¹

*Department of Family and Preventive Medicine, University of California, San Diego, CA, USA*¹; *Active Living Research, San Diego State University, San Diego, CA, USA*²; *School of Public Affairs, San Diego State University, San Diego, CA, USA*³; *California Institute for Telecommunications and Information Technology, University of California, San Diego, CA, USA*⁴

The central role of places in which physical activity is done is now widely recognized, so it is important to measure both activity and its location. The aim of this research is to develop and refine a portable tool and supporting software to capture, store and analyze physical activity and energy expenditure (PAEE) captured real-time in a geospatial context. To date there is no measurement device for researchers that is capable of simultaneously and objectively collecting PAEE (by combined heart rate and motion: HR+M) and location (by Global Positioning Systems: GPS data). These objective measures will provide significant advantages over currently-available self-reports. Understanding how PAEE varies by physical location is essential to researchers exploring how environmental factors such as the built environment, crime, the availability of parks and recreation facilities, or terrain (hilly vs. flat) influence PA.

This project will be performed by an interdisciplinary group of researchers, consultants and companies with expertise in physical activity and energy expenditure measurement, active living research, software engineering, wireless sensor development, cell phone technologies, GPS and geographic information systems (GIS) technologies, and data modeling. The project will occur in four phases:

- Phase I: Specify, build and bench test the portable data collection device using a cell phone platform that receives data wirelessly from both an HR+M monitor and a highly accurate GPS device. Wireless connection and integration is the primary hardware innovation. Develop data-server and web-server software that supports the portable device including new application program interfaces as well as methods to integrate into existing and well established GIS systems (e.g. ArcGIS). (15 months)

- Phase II: Perform usability and field data capture testing on the portable tool among a multiethnic sample of adolescents (age 12-20), adults (age 21-60) and older adults (age 61+); total n=45. (9 months)

- Phase III: Use data captured in Phase II to develop new, and validate currently used, methods of data modeling and visualization appropriate to PAEE and geospatial research. Based on user feedback improve the tool and software for use in Phase IV. (12 months)

- Phase IV: Field test the use of the entire tool and supporting server and web software in free-living adolescents, adults and older adults (n=45) and test the utility of the system as a support to research on geospatial aspects of PAEE.