

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE  
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# COMPUTER SCIENCE COLLOQUIUM

## Searching The Cyber While Seeing The Physical

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### Abstract:

The cyber-physical systems (CPS) are envisioned as a class of real-time systems integrating the computing, communication and storage facilities with monitoring and control of the physical world. One interesting CPS application in the mobile Internet is to provide search on the spot regarding the physical world that a user sees, or literally WYRIWYS (What-You-Retrieve-Is-What-You-See).

Two different scenarios are identified from the needs for WYRIWYS. (1) The first scenario considers to support retrieving objects with the availability of a virtual world model of the surroundings. The underlying problem is to find “spatial Web objects” which are both visually conspicuous and semantically relevant to the user. The problem is defined as to answer a spatio-visual keyword (SVK) query. State-of-the-art spatial indexing methods are mostly distance-based and thus inapplicable for supporting such query. I will be introducing a solution to efficiently process the SVK query.

(2) The second scenario aims at recognizing the objects that a user sees through smartphone camera, with the availability of online geo-tagged images of such objects. This problem is formulated as, given a database of places-of-interest (POIs), a set of images associated with each POI, and a query photo with its camera parameters known, find the POI appearing in the photo. The challenges here are two-fold. First, the camera location is error-prone. Second, the online geo-tag photo repositories are contaminated by irrelevant images (noises). The Knowing Camera project provides a framework to address such challenges. The distinguishing feature of the framework is its ability to perform well in contaminated, real-world online image database. Besides, the framework is highly scalable as it does not incur any complex data structure.

Host: Yongluan Zhou