

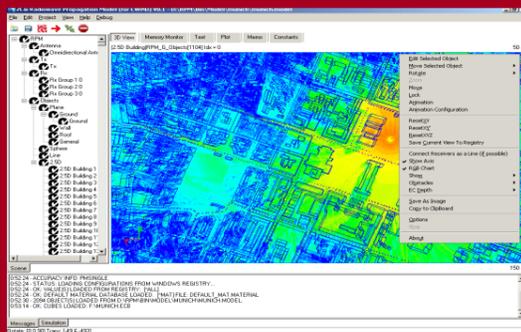
A FAST AND ACCURATE PROPAGATION MODEL FOR URBAN COVERAGE PREDICTION

Zhihua Lai, Nik Bessis, Jie Zhang and Gordon Clapworthy

zhihua.lai@beds.ac.uk

CONTEXT

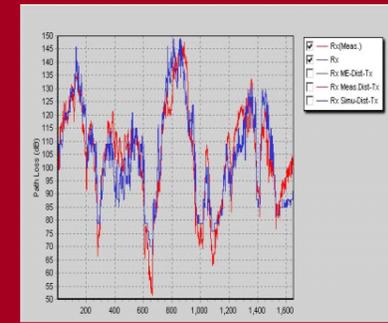
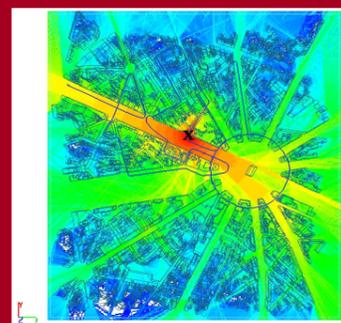
- radiowave propagation prediction is key to the quality of wireless networks to be designed
- the need for fast, accurate predictions from academic and industry is increasing rapidly
- empirical models are becoming obsolete
- huge demand for deterministic approaches but these are immature
- **core idea: develop a fast and accurate approach to predicting huge numbers of receiver points**



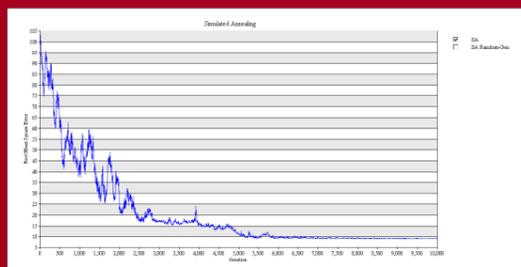
CWiND Radiowave Tracer

OBJECTIVES

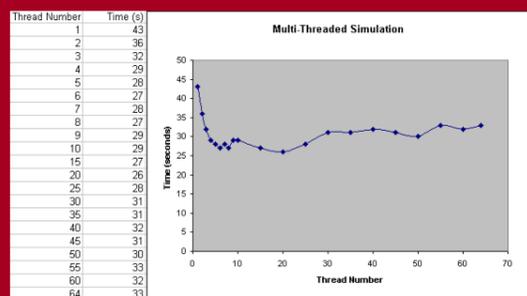
- study and analyze existing approaches
- design a fast, accurate model (few minutes, 6-8 dB)
- target a huge number of receiver points (few million)
- employ parallel computing technologies
- provide a fast, accurate solution for analysing other parameters apart from path loss
 - Power Delay Profile (PDP)
 - Directions of Arrival (DOA)



Paris Prediction



Auto Calibration based on Simulated Annealing



Multi-threading Improvement on AMD 64 Dual Core

ACCELERATION

- avoid double marking in diffractions, reflections and Line-Of-Sight (LOS)
- avoid trapping in some certain areas
- avoid calculating information that can be pre-processed

MODEL COMPONENTS

- Pre-processing Engine => Cube Databases (CD)
- Ray Tracer Engine => Energy Cubes (EC)
- Post-processing Engine => Graphics
- Auto Calibration => Simulation Annealing

RESULTS

- CWiND Radiowave Tracer V0.1 (Written in Object Pascal, C++ and Assembly, More than 40K LOC)
- multi-threading simulations improve speed on multi-core by around 80%
- auto-calibration is fast, each iteration is not an entire simulation. Rather, it takes few calculation.
- accuracy and speed remain improvement.

FUTURE PLANS

- improve it, make it faster and more accurate
- parallelise it (GPU, Multi-Core, Distributed ...)
- make it suitable for analysis of other parameters apart (listed in Objectives) from path loss