

A two-tier mobility generator for wireless simulations

Wing-Hong Siu, Ling-Man Chan
(University of New South Wales)

Kun-Chan Lan
(National ICT Australia)

Outline

□ Introduction

- Existing issues
- Our objectives

□ 2TMM

- Traces
- Parameters

□ Evaluation

Outline

Introduction

2TMM

Evaluation

Introduction

□ Existing mobility models

- eg. Random Waypoint (RWP), Random Walk, etc
- ✓ Simple in implementation and analysis
- ✗ Realistic
- ✗ Comparable to real world movements
- ✗ Capture multiple types of mobility patterns

Outline

Introduction

- Existing issues
- Objectives

2TMM

Evaluation

Introduction

□ Realistic movements

- ↪ Affected by the geographical distance of the trip
- ↪ Affected by the type of transportation used
- ↪ Different types of transportation modes have different sets of characteristics

Outline

Introduction

- Existing issues
- Objectives

2TMM

Evaluation

Introduction

□ A Multi-Tier Mobility Model

- To create more realistic movements in simulation
- Each tier characterizes a different mobility pattern
 - ⊕ introduced by the use of different transportation modes

□ A Parameterized Mobility Generator

- To generate realistic synthetic mobility traces for ns-2 simulations

Outline

Introduction

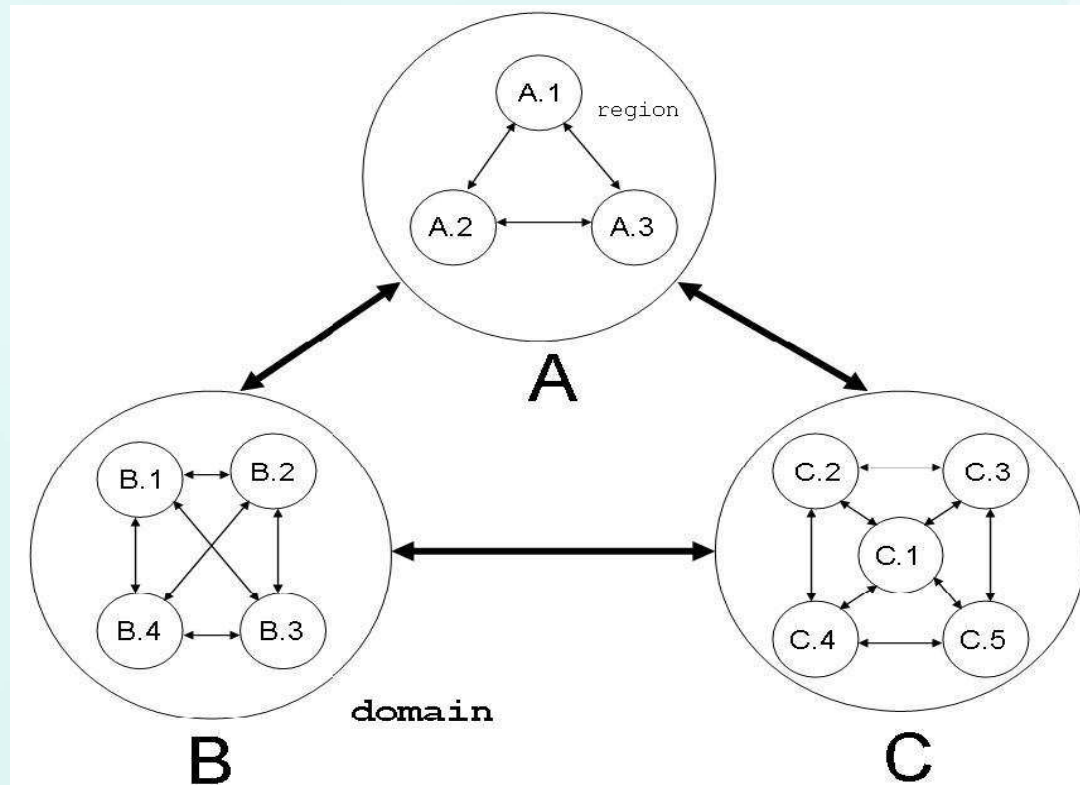
- Existing issues
- Objectives

2TMM

Evaluation

A Two-Tier Mobility Model

- **Micro-mobility** (movements between Regions) and **Macro-mobility** (movements between Domain)



Outline

Introduction

2TMM

- Traces
- Parameters

Evaluation

A Two-Tier Mobility Model

- **Developed based on experimental data collected from two sources**
 - **(macro-mobility) study of personal travel behavior held by US Department of Transportation in Lexington, Kentucky**
 - ⊕ Used GPS on vehicles to record travel information for one week
 - ⊕ 100 households with an average 3 vehicles per household
 - **(micro-mobility) data from Dartmouth College campus WiFi network**
 - ⊕ Over 500 wireless cells visited by more than 6000 users for a period of 2 years

Outline

Introduction

2TMM

- Traces
- Parameters

Evaluation

A Two-Tier Mobility Model

□ Observation from the data

- Different transportation modes can introduce different movement patterns

□ Parameters at each tier

- Original spatial distribution of the users
- Preference of the movement (micro vs. macro)
- User departure rate from the origination and arrival rate to the destination
- Selected destination and preferred path
- Trip length
- User residence time in one particular region

Outline

Introduction

2TMM

- Traces
- Parameters

Evaluation

Evaluation

❑ **To understand the impact of our model on the performance of ad-hoc routing protocols via ns-2 simulations**

❑ **Metrics for evaluation**

- **Node density**
- **Path duration**
- **Data delivery rate**
- **Control packet overhead**
- **End-to-end delay**

Outline

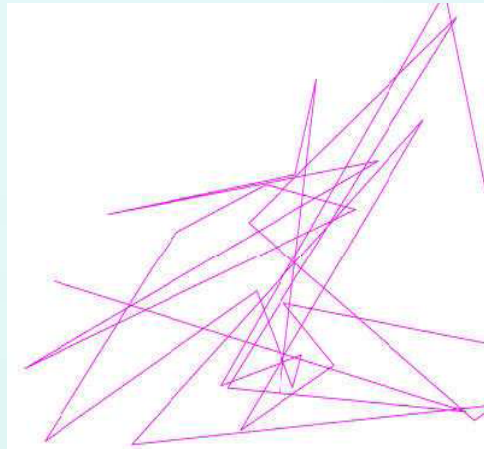
Introduction

2TMM

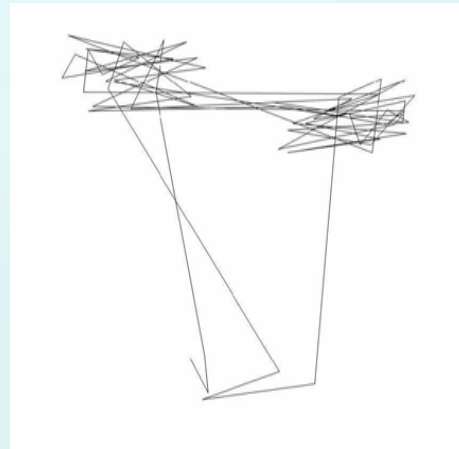
Evaluation

Evaluation

- ❑ **Two-Tier mobility model exhibits a stronger spatial locality**



Traveling pattern of a mobile node using Random Waypoint Model



Traveling pattern of a mobile node using Two-Tier Model

Outline

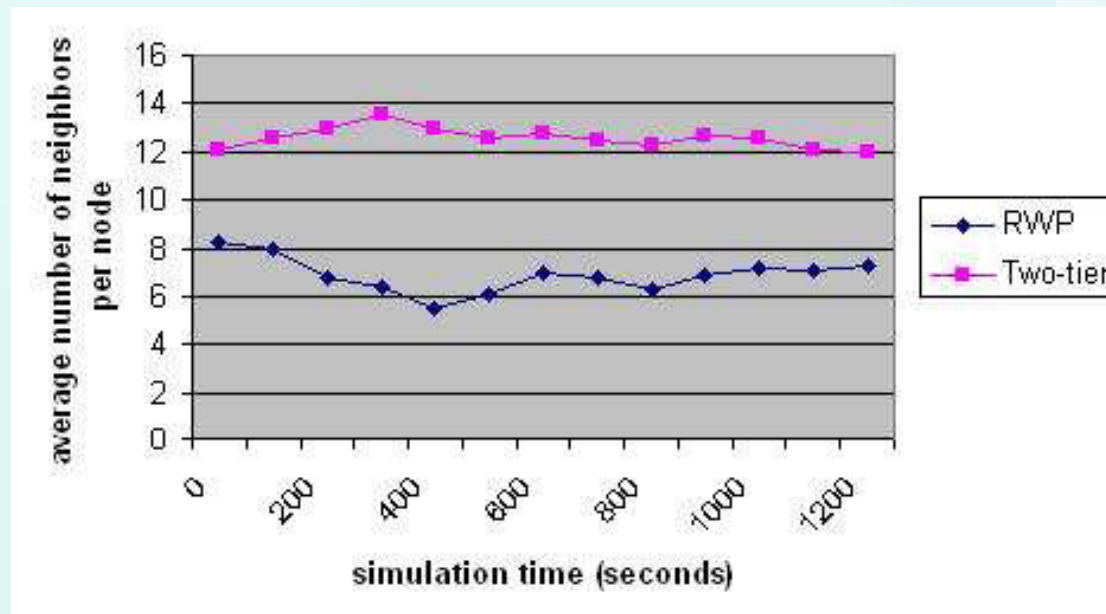
Introduction

2TMM

Evaluation

Evaluation

- **Two-Tier mobility model exhibits a higher clustering of nodes**



Outline

Introduction

2TMM

Evaluation