designed to respond to the PT07 – Mainstreaming Gender Equality and Promoting Work Life Balance (2nd Open Call - Support the development of tools and methods to promote gender equality at the local level) under the European Economic Area Financial Mechanism (EEA GRANTS)

FROM PHYSICAL TO DIGITAL SPACES
Exploring space-time mobility through a telegeomonitoring approach

Institute of Geography and Spatial Planning, University of Lisbon, Portugal

Margarida Queirós  |  Nuno M. da Costa  |  Paulo Morgado  |  Mário Vale  |  Nelson Mileu  |  Fábio Rodrigues  |  Júlia Guerreiro
OUTLINE

About the project | why is it important? goals and expectations
About the methodology | how do we address the problem?
Analysis & results | space-time proxies
From physical to digital spaces | synthesis & conclusions
ABOUT THE PROJECT

why is it important?

Gender awareness of mobility/travel behaviours: implications for city planning and transport planning.

Wider understanding of gender differences in daily trips associated with gendered divisions of labour.

Wider understanding of time uses between paid employment and unpaid work (in the home, care, personal, leisure and related) in urban space.

New methodology VGI (Volunteered Geographic Information) using smartphones, trackers, software, GIS and the Web.
ABOUT THE PROJECT

why is it important?

According to HETUS/Harmonised European Time Use Survey 1998-02 (EUROSTAT, 2008) and the Statistics in Focus (2006), in the EU the time-use patterns show significant differences between men and women and between countries.

<table>
<thead>
<tr>
<th>Household activities</th>
<th>Women (h/day)</th>
<th>Men (h/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
<td>4.5</td>
<td>1.4</td>
</tr>
<tr>
<td>Italy</td>
<td>5.2</td>
<td>1.3</td>
</tr>
<tr>
<td>UK</td>
<td>4.1</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Daily Telegraph, 23 February 2016. What superpower do you wish to had?
Melinda Gates: “More time”. Recognizing, redistributing, and reducing the unpaid work that women do.
ABOUT THE PROJECT

why is it important?

People who have reported to perform caring activities (%) 2004

Source: European Social Survey, 2004
ABOUT THE PROJECT

why is it important?

In Portugal there is a gap (Queirós & Costa, 2012): there are no systematic studies on mobility and the use of time with a territorial/local demonstration…

The National Statistics Institute (INE) conducts a national survey without a stabilized frequency (1999, 2016?...), based on questionnaires (socio-demographic) and diaries (users are asked to annotate their tracks with the activities they have done each 10 minutes, for week and weekend days)

Source: INE, Inquérito à Ocupação do Tempo, 1999
ABOUT THE PROJECT
why is it important?

Car vs Public Transport vs Walking Grande Lisboa

Workplace in relation to place of residence Grande Lisboa

Different mobilities...

Source: INE, Census 2001, 2011
ABOUT THE PROJECT

why is it important?

ABOUT THE PROJECT

why is it important?


NUTS 3 Grande Lisboa.
Transport mode for journey purpose (household-working/place-school)

Portugal (Mainland).
Transport mode for journey purpose (household-working/place-school)
ABOUT THE PROJECT
goals and expectations

- Complying with objectives Europe 2020 (smart, sustainable and inclusive growth), Community directives and regulations, Portuguese Constitution, Portuguese laws

- Combining smart cities and big data analysis with qualitative research

- Developing tools and methods for promoting gender equality at the local level (balancing professional/private life)

THEORETICAL AND METODOLOGICAL
(accurate knowledge about the differences in daily trips, use of time, and implications for the labour market; low cost methodology to be replicated in similar studies)

COOPERATION
(fostering the exchange of knowledge; partnership for internationalization; synergies university-business-authorities)

EDUCATIONAL
(produce outputs for wide dissemination – e.g. dashboard, video)

POLITICAL
(identify gaps in national and local policies and propose measures to overcome them)

The nature of GenMob goals
ABOUT THE METHODOLOGY

how do we address the problem?

Why not do we use “XXI century technology” / mobile operating systems?

GenMob project fills this gap tracking data using GPS, using a reliable, original and innovative methodology:

- makes use of smartphones with GPS and App’s available at no market charge (Moves)
- enables the implementation of the data collected by its application to a digital platform for geovisualization
- the project recipients (participants/volunteers) are co-producers of information (VGI)
## ABOUT THE METHODOLOGY

**how do we address the problem?**

<table>
<thead>
<tr>
<th>Traditional Surveys/Diaries</th>
<th>GenMob Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on surveyed memory</td>
<td>Real – Time Data acquisition</td>
</tr>
<tr>
<td>Subjectivity – Depends on each surveyed person’s perception of the trip/activity</td>
<td>Accurate and objective</td>
</tr>
<tr>
<td>Data Georeferenced</td>
<td>Detailed Spatial Statistics</td>
</tr>
<tr>
<td>Census track data: only for home-work trips or home-school trips for each parish to home parish or municipality destination</td>
<td>Low cost for data acquisition</td>
</tr>
<tr>
<td></td>
<td>Faster data manipulation</td>
</tr>
<tr>
<td></td>
<td>VGI – bottom-up, open process, data co-creation; positive emotional value to users, (satisfaction, social connection and ethics)</td>
</tr>
</tbody>
</table>
ABOUT THE METHODOLOGY

how do we address the problem?

1. DOWNLOAD E INSTALAÇÃO DA APP
   - Aplike o Google Store, pesquise por Moves e instale.

2. CERTIFICAR QUE O GPS ESTÁ LIGADO
   - Ativa os serviços de localização.
   1. No MENU Secundário, prima para ativar GPS
   2. No MENU principal, aceder à CONFIGURAÇÕES - SERVICES DE LOCALIZAÇÃO

3. FAZER O PERCURSO NORMAL DO DIA A DIA
   - Nada é necessário a usar smartphone entro 2 dias. Pode guardar-lo em bolsa durante esta noite.

4. LIGAR À REDE WIFI PARA UPLOAD DOS DADOS
   - Ligue o seu telefone à uma rede Wi-Fi para que possa fazer o upload da informação para o cloud, para que posteriormente os novos serviços possam utilizar.

5. ANTES DE DESLIGAR O PERSONAL TRACKER E CARREGAR

6. Function Guide
   - Note: Please contact your vendor if you do not receive these data cables.

Tomei conhecimento da fim a que os meus dados pessoais se destinam, colaborarei voluntariamente e dou autorização para o estudo e tratamento dos meus dados.
ABOUT THE METHODOLOGY

how do we address the problem?

**SMARTPHONE TRACKING SPATIAL DATA:**
- Creation of a geographic database for GPS Tracking Data and Smartphone Tracking Data
- Disaggregating the whole table and dividing by participant
- Importing tables to GIS Software and Converting into shape files for spatial analysis
- Disaggregating Time column and dividing into Day, Hour and Decimal Hour
- **Coding Tracking Data into two different files:**
  - Points of Interest: Coding activities; Calculation of the duration of each participant on each activity; (note: calculation of 25mt buffer for counting points on each activity)
  - Coding Paths: Coding Activities and Modes of Transportation; Calculation of Starting and Ending Time of the Path, Duration and Distance

**SURVEY DATA:**
- Coding each question and answer
- Importing to a matrix
- Importing to a database for crossing with spatial data
ABOUT THE METHODOLOGY

how do we address the problem?

Stop Detection
Path Identification
Infer Activity
Create Storyline

Raw Data
- data capture

Real Path
- data storage
- data analysis
- data visualisation

Stops and paths identified and coded according to the classification in the methodology.
ANALYSIS & RESULTS

Spacetime proxies

A sample from Alcochete, Montijo and Lisboa

GenMob VGI (participants / volunteers /citizens actors/people as sensors)

(Jan – May 2016)
ANALYSIS & RESULTS

Space-time proxies

<table>
<thead>
<tr>
<th>Location</th>
<th>Percentage of Stops</th>
<th>Nr of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcochete</td>
<td>72% 28%</td>
<td>13</td>
</tr>
<tr>
<td>Barreiro</td>
<td>80% 20%</td>
<td>18</td>
</tr>
<tr>
<td>Lisboa</td>
<td>70% 39%</td>
<td>20</td>
</tr>
</tbody>
</table>

A sample from Lisbon Metropolitan Area: Alcochete, Montijo and Lisbon

<table>
<thead>
<tr>
<th>Location</th>
<th>Women</th>
<th>Men</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcochete</td>
<td>9</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Barreiro</td>
<td>14</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>Lisboa</td>
<td>12</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>16</td>
<td>51</td>
</tr>
</tbody>
</table>

Avg Distances, Nr of paths, Paths executed from A to B

<table>
<thead>
<tr>
<th>Gender</th>
<th>Avg Distance (km)</th>
<th>Nº Path</th>
<th>Path Length (avg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>21.55</td>
<td>5.25</td>
<td>4104.91</td>
</tr>
<tr>
<td>Women</td>
<td>22.41</td>
<td>6.18</td>
<td>3628.32</td>
</tr>
</tbody>
</table>

Source: GenMob, 2016
ANALYSIS & RESULTS

Space-time proxies

Avg distance (m) by sex for the following motives:

- Lunch
- Sports
- Others
- Family Care
- Shopping and Services
- Leisure
- Work
- Home

Avg time spent (hours) by sex for the following motives:

- Lunch
- Sports
- Others
- Family Care
- Shopping and Services
- Leisure
- Work
- Home

Avg distance (m) by sex for the following for each trip by modes:

- Bicicle
- Train
- Motocicle
- Metro
- Bus
- Car
- Walking

Avg time spent (hours) by sex for the following for each trip by modes:

- Bicicle
- Train
- Motocicle
- Metro
- Bus
- Car
- Walking

Source: GenMob, 2016
## ANALYSIS & RESULTS

### Space-time proxies

### Avg time (hours) spent on each activity

<table>
<thead>
<tr>
<th></th>
<th>Home</th>
<th>Paid Work</th>
<th>Leisure</th>
<th>Shopping &amp; Services</th>
<th>Care Work</th>
<th>Sports</th>
<th>Meals (out)</th>
<th>Volunteering</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcochete</td>
<td>13,75</td>
<td>6,81</td>
<td>1,44</td>
<td>0,52</td>
<td>0,19</td>
<td>1,99</td>
<td>0,82</td>
<td>0,00</td>
</tr>
<tr>
<td>Barreiro</td>
<td>13,24</td>
<td>6,98</td>
<td>0,00</td>
<td>0,57</td>
<td>0,07</td>
<td>1,99</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>Lisboa</td>
<td>13,93</td>
<td>6,82</td>
<td>1,44</td>
<td>0,46</td>
<td>0,24</td>
<td>0,00</td>
<td>0,84</td>
<td>0,00</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcochete</td>
<td>13,32</td>
<td>6,93</td>
<td>0,58</td>
<td>0,58</td>
<td>0,41</td>
<td>1,14</td>
<td>0,74</td>
<td>1,49</td>
</tr>
<tr>
<td>Barreiro</td>
<td>13,09</td>
<td>7,23</td>
<td>0,29</td>
<td>0,69</td>
<td>0,46</td>
<td>0,83</td>
<td>0,64</td>
<td>1,49</td>
</tr>
<tr>
<td>Lisboa</td>
<td>13,64</td>
<td>6,67</td>
<td>1,28</td>
<td>0,55</td>
<td>0,07</td>
<td>1,84</td>
<td>0,00</td>
<td>0,00</td>
</tr>
</tbody>
</table>

Source: GenMob, 2016
ANALYSIS & RESULTS

Space-time proxies

ALCOCHETE

Source: GenMob, 2016
ANALYSIS & RESULTS

Space-time proxies

Source: GenMob, 2016
ANALYSIS & RESULTS

Space-time proxies

Classical Time-Geography, the Prism (Hagerstrand 1970)

GenMob, 2016
Developing Time-space GIS

space–time path in continuous three-dimensional space

space–time path in continuous two-dimensional space
## ANALYSIS & RESULTS

### Space-time proxies

![Visualization Diagram]

<table>
<thead>
<tr>
<th>Meio de Transporte</th>
<th>Homens</th>
<th>Mulheres</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30.000</td>
<td>10.000</td>
</tr>
<tr>
<td>B</td>
<td>15.000</td>
<td>5.000</td>
</tr>
<tr>
<td>C</td>
<td>5.000</td>
<td>1.666</td>
</tr>
<tr>
<td>D</td>
<td>2.500</td>
<td>833.333</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motivo de Deslocação</th>
<th>Homens</th>
<th>Mulheres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casa</td>
<td>3.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Compras e Serviços</td>
<td>1.500</td>
<td>0.500</td>
</tr>
<tr>
<td>Desporto</td>
<td>0.500</td>
<td>0.166</td>
</tr>
<tr>
<td>E</td>
<td>0.250</td>
<td>0.083</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distância Viagem (Km)</th>
<th>Homens</th>
<th>Mulheres</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.4Km</td>
<td>138</td>
<td>35%</td>
</tr>
<tr>
<td>25.6Km</td>
<td>65%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distância Viagem (Km)</th>
<th>Homens</th>
<th>Mulheres</th>
</tr>
</thead>
<tbody>
<tr>
<td>28.5Km</td>
<td>65%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tempo Gasto (h)</th>
<th>Homens</th>
<th>Mulheres</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.10</td>
<td></td>
<td>6.13</td>
</tr>
</tbody>
</table>
FROM PHYSICAL TO DIGITAL SPACES

Synthesis & conclusions

- Place-based indicators
- Bottom-up methodology and synchronic data
- VGI, turning people into sensors (the willingness of women and men to contribute to data collection, sharing and ... to causes that matter)
- BIG... messy data (real time insights)
- Sensors (measuring, evaluating) coming together with infrastructure/machines functioning with the cloud (IoT – Internet of Things)
- Smartphones/trackers as mobile sensors for enhancing public policies
FROM PHYSICAL TO DIGITAL SPACES

Synthesis & conclusions

Men
Do less activities than women
Spend less time traveling... but travel longer distances
Spend more time in leisure activities

Women
Do more daily activities than men
Use more the car for traveling than men
Spend more time in care work and travelling (multiple trip chain)
Spend more time in shopping activities
Walk more, but slower (shopping and caring)
FROM PHYSICAL TO DIGITAL SPACES

Exploring space-time mobility through a telegeomonitoring approach

http://genmob.ceg.ulisboa.pt/

info.genmob@gmail.com

Thanks for your attention!

PT07 – Mainstreaming Gender Equality and Promoting Work Life Balance (2nd Open Call - Support the development of tools and methods to promote gender equality at the local level) under the European Economic Area Financial Mechanism (EEA GRANTS)