ESQUEMA DE LA PRESENTACIÓN

1. Breve descripción del plan de doctorado y del proyecto que lo financia (FPI)
   - Objetivo.
   - Marco de Trabajo: Modelos Dinámicos de cambios de usos de suelo en regiones urbanas.
   - Metodología: Construyendo un modelo dinámico basado en autómatas celulares sobre una plataforma SIG.

2. Explorando las limitaciones de CORINE Land Cover para el modelado de usos de suelo.
   - Objetivo.
   - Metodología: Comparación de las geodatabases CLC-MLU a diferentes escalas.

3. Conclusiones.

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Un sistema en el cual un gran red de componentes sin sin un control central y una serie de reglas simples operan incrementando la complejidad de su comportamiento colectivo, procesando información sofisticada en un proceso de aprendizaje y adaptación.
1. Brief description of the whole project where this work is included. - Objective:

**PROJECT : RELATIONSHIP AMONG LAND USE AND URBAN MOBILITY.**

**MARS**

Metropolitan Activity Relocation Simulator

**CA**

Cellular Automata

Regional Transport and Land Use Dynamic Model
Municipality (Scale)

Regional Land Use Dynamic Model
25x25 m. cell (Scale)

**TRANSyT - Transport Research Centre - UPM**

**Human Geography Department UCM**

**Acknowledgements:** Financial support from Ministerio de Ciencia e Innovación (project TRA2008-06682) is gratefully acknowledged.

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1. Brief description of the whole project where this work is included. - Framework:

**THE URBANIZATION PHENOMENA AND THE URBAN STRUCTURES DEVELOPMENT...**

...continues intensively since the first industrial cities bloomed in Europe and U.S.

...It is occurring in every large urban world region but in a different way (proportions, rates of growth, shapes...)

Despite this evolutorial diversity, the large active urban spaces share common characteristics. A high level of dynamism and high index of growth.

Can we approach the urban phenomenon through the land use dynamics?

**GEOGRAPHICAL MODELS, IMPLEMENTED TECHNIQUES IN GIS . CA, ANN...**

**ENDOGENOUS AND EXOGENOUS FACTORS**

**PATTERNS GENERATION**

**LAND USE DYNAMICS**
1. Brief description of the whole project where this work is included. - Methodology:

**CELLULAR AUTOMATON ELEMENTS**

- A **Euclidean space** divided into an array of identical cells.

- A cell **neighbourhood**.

**CONVENTIONAL CELLULAR AUTOMATON**

- A set of discrete **cell states**.

- A set of **transition rules**, which determine the state of a cell as a function of the states of cells in the neighborhood.

- **Discrete time steps**, with all cell states updated simultaneously.
LAND USE CHANGE DYNAMIC MODEL

FUTURE SCENARIOS

LAND USE CHANGE BEHAVIOUR

POTENTIAL TRANSITION (RULES)

VALIDATION

CALIBRATION

MAP COMPARISON

LAND USE Period $t_0$ (2000)

LAND USE Period $t_6$ (2006)

Simulation LAND USE Period $t_6$ (2006)

True LAND USE Period $t_0$ (2009)

Simulation LAND USE Period $t_9$ (2009)

True LAND USE Period $t_6$ (2006)

Changing rules
Changing demand

Where?

How much?
$\hat{P}_{x,y} = (1 + \hat{A}_{x,y}) (1 + \hat{S}_{x,y}) (1 + \hat{Z}_{x,y}) (1 + \hat{N}_{x,y})$ 

Adapted from: Engelen, G.; White, R.; Uljee, I.; Drazan, P. (1995)
Exploring the limitations of CORINE Land Cover for modeling urban land use change.
Jaime Díaz Pacheco
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Dir. Dr. Javier Gutiérrez Puebla
Universidad Complutense. Departamento de Geografía Humana.
2. Exploring the limitations of CORINE Land Cover for monitoring urban land use changes.

- **Objective:**
  - Measure to what degree CLC is applicable for an urban CA-BASED land use modeling at particular scales.

- **Methodology:**
  - Compute possible underestimations and overestimations of CLC on artificial (urban) land use, by comparison with a higher precision regional land use geodatabase (MLU) at particular scales of analysis.

```
TOTAL AREA OF ARTIFICIAL LAND 2000 & 2006

LAND USE CHANGE TO ARTIFICIAL LAND 2000-2006

According CLC

Comparison

According MLU

Regional Scale (Madrid Community)

Local Scale (municipalities)
```
2. Exploring the limitations of CORINE Land Cover for monitoring urban land use dynamics.
- Methodology: Comparison of geodatabases CLC-MLU at different scales.

**CORINE Land Cover.**
- EU. EEA.
- Coordinate, homogenize, LULC information in EU.
- 25 ha. m.m.u.
- Remote Sensing/Automatic and visual. (Computer-assisted classification)

**MADRID Land Use.**
- UCM (H. Geography).
- LU and urban mobility (Madrid C.).
- 0.25 ha. m.m.u.
- Photo interpretation, cartography support.

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A NEW SET OF CATEGORIES TO ASSIMILATE CLC and MLU CLASSES.

<table>
<thead>
<tr>
<th>CATEGORIES LEVEL 1 MLU</th>
<th>NEW CLASS (ASSIMILATION)</th>
<th>CATEGORIES LEVEL 1 CLC (CLASS 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESIDENTIAL MULTI-HOUSEHOLD</td>
<td>URBAN RESIDENTIAL</td>
<td>CONTINUOUS URBAN FABRIC</td>
</tr>
<tr>
<td>RESIDENTIAL SINGLE-HOUSEHOLD</td>
<td>URBAN RESIDENTIAL</td>
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<td>FACILITIES</td>
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<td>INDUSTRIAL</td>
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<td>INDUSTRIAL AND COMMERCIAL UNITS</td>
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<td>SANITARY FACILITIES</td>
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<tr>
<td>OFFICE AND RETAIL SERVICES</td>
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<tr>
<td>INFRASTRUCTURES (others)</td>
<td></td>
<td></td>
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<tr>
<td>INFRASTRUCTURES (network)</td>
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<td>ROAD AND RAIL NETWORK AND ASSOCIATED LAND</td>
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<td>URBAN GREEN</td>
<td>GREEN URBAN AREAS</td>
</tr>
<tr>
<td>NON-URBAN LAND</td>
<td>NON-URBAN LAND</td>
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</tr>
</tbody>
</table>

CLASSES 2,3,4,5, CORINE LAND COVER (LEVEL 1)
COMPARISON OF ARTIFICIAL LAND USE COMPUTED BY CLC AND MLU AT REGIONAL SCALE.


2. Exploring the limitations of CORINE Land Cover for monitoring urban land use dynamics.
- Methodology: Comparison of geodatabases CLC-MLU at different scales.

ARTIFICIAL LAND USE EVOLUTION, 2000-2006. OVERESTIMATIONS AND UNDERESTIMATIONS, CLC.
2. Exploring the limitations of CORINE Land Cover for monitoring urban land use dynamics.

- Methodology: Comparison of geodatabases CLC-MLU at different scales.
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<table>
<thead>
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<th>Underestimations</th>
<th>Overestimations</th>
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<tr>
<td>n</td>
<td>128</td>
<td>51</td>
</tr>
<tr>
<td>(\bar{X})</td>
<td>55.25</td>
<td>36.42</td>
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<tr>
<td>s</td>
<td>83.46</td>
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<td>Max</td>
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<td>Min</td>
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</table>

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EXAMPLES: AREAS CLASSIFIED AS SPORT AND LEISURE CATEGORY, WHICH HAVE OTHER USE

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EXAMPLES: AREAS MAPPED IN CLC 2000, NOT MAPPED IN 2006


Location of negative growth areas.

Hectareas
- Negative Growth
- < 250
- 250 - 500
- 500 - 1.500
- 1.500 - 2.500
- 2.500 - 30.000

Location of negative growth areas.
3. CONCLUSIONS.

- This work has tried to explore the coherence of CORINE land cover and its capacity to serve as input land use geodatabase for modeling urban land use change.

- CORINE land cover may be useful to work at small scales (coarse resolution) for assessing urban land use change, but it is not so suitable to work at scales greater (finer resolution) than 1:100,000. It is necessary to be aware of this limitation of CLC for urban modeling.

- Recently in the EU a new LULC geodatabase at a larger scale (0.25 ha. m.m.u.) is available for large cities (urban regions), nonetheless there is still only one time period geotabase (2010 for Madrid).

- The measurements of artificial land use do not show a high difference in quantity of land use computed between CLC and MLU for 2000 and 2006 (static method), nonetheless if the evolution of artificial land uses between 2000-2006 is computed, there is a marked increase in the difference between CLC and MLU.

- The overestimations and underestimations of CLC over MLU increase as we increase the scale of analysis (regional-municipal). In other words the error degree tends to increase with the scale.

- Certainly the land use classes behavior is not the same for every category. There are extreme cases as the evolution of road network according CLC. In fact if we analyze the data we find decrease rather than increase for these categories between 2000-2006. This kind of problem makes results from CLC incoherent.
Thank you!
Gracias!