Universidade do Minho
Departamento de Informática

SENSORIZATION AND INTELLIGENT SYSTEMS IN ENERGETIC SUSTAINABLE ENVIRONMENTS

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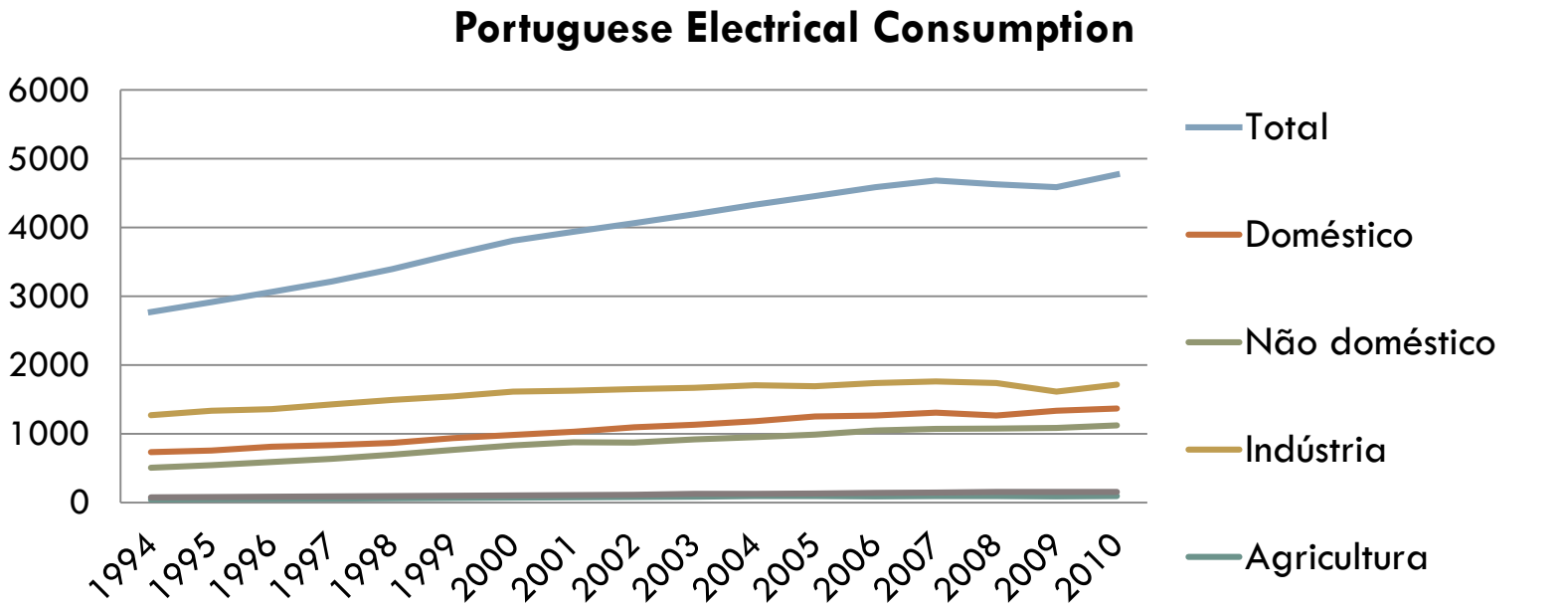
Calambria, Italy 24-26 September

Introduction

- Increased consumption of energy
- Energy efficient assessment deficiencies
- People response to energy awareness



Source: www.portdata.pt

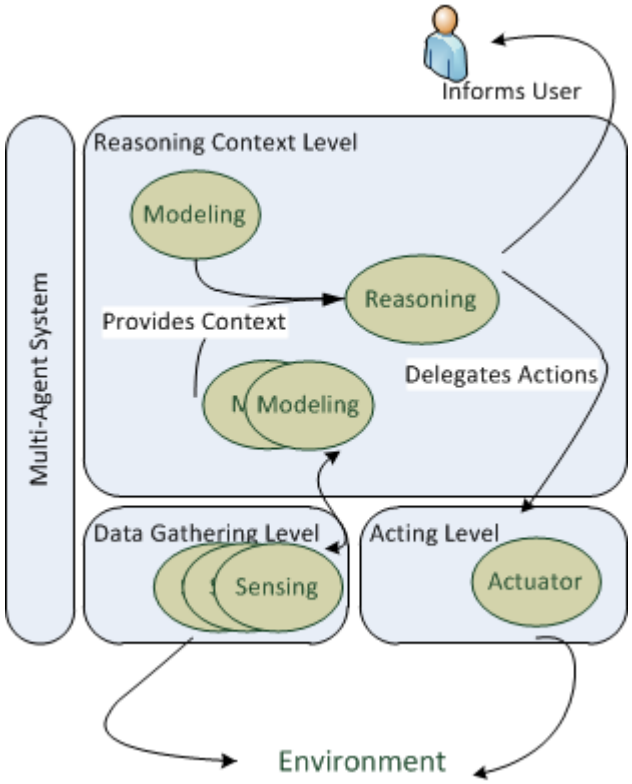
Previous Study

- Sustainability
- Machine Learning
- Context-Aware Computing

Including…

- Human Tracking
- User Awarenes
- Intelligent Systems
- Affective Computing

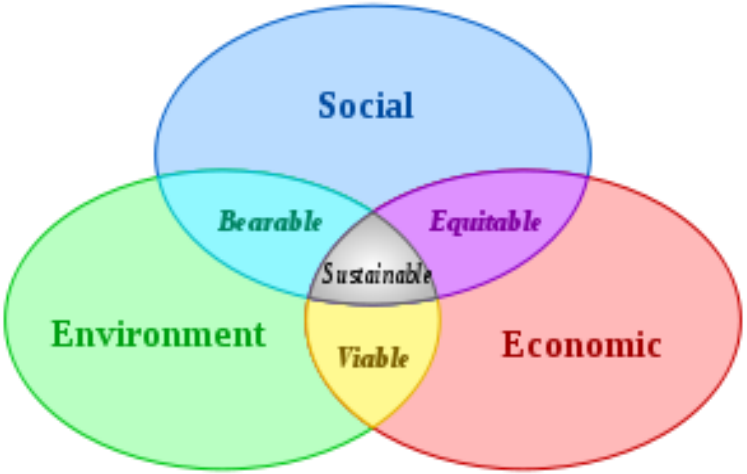
Developments



- Multi-Agent System
  - Sense
  - Model
  - Reason
  - Act

Developments

- Defining Sustainability



Developments

- Defining Sustainable Metrics

Sustainable Indicators		
Economical	Environmental	Social
$\frac{EnergeticCosts}{IncomeAvailable}$	$\frac{EmissionTreated}{TotalEmission}$	$\frac{TimeInside}{TimeOutside}$

- Measuring Comparative Indexes

$$S_{index} = \alpha * I_{economic} + \beta * I_{enverinmental} + \gamma * I_{social}$$

$$\alpha + \beta + \gamma = 1 \wedge 0 < \alpha < 1 \wedge 0 < \beta < 1 \wedge 0 < \gamma < 1$$

Developments

- Derive experiments both in real and simulated environments
- Ensure coherance in simulated environments so conclusions can be derived before real set ups are built/planned
- Plan proactive and sustainable action to assure the correct use of energy resources contemplating their availability and cost

Developments

- Real Environmnet
  - ISLab – University of Minho
    - 1 room
    - Frequented by a group of people with different schedules
    - Ligth, temperature and presence sensors
- Simulated Environment
  - Standard Appartment
    - 4 rooms
    - 1 person
    - Eletrical and presence sensors

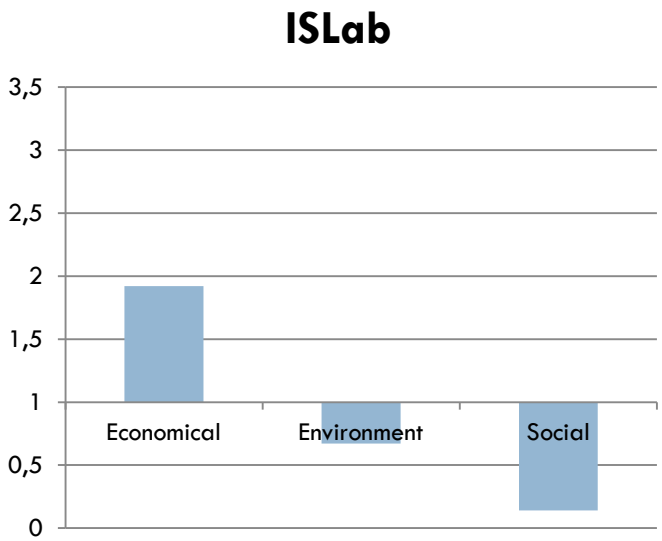
Initial Results

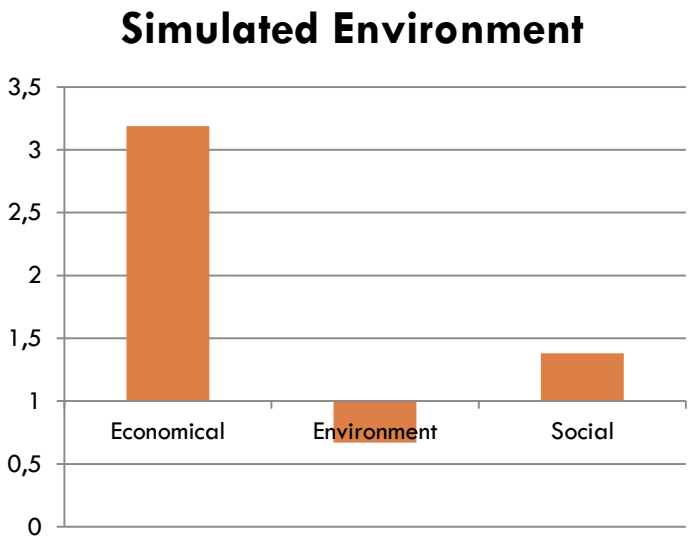
- Results from environment monitoring

ISLab			
Room	Carbon Emission (g)	Energetic Consumption (kW)	Presence (%)
ISLab	7078.46	21.80	11
Simulated Environment			
Room	Carbon Emission (g)	Energetic Consumption (kW)	Presence (%)
Bedroom	5.51	0.02	55
Kitchen	3537.32	9.95	9
Living Room	994.43	2.80	32
Bathroom	3.47	0.01	1
Hall	13.87	0.04	3

Initial Results

- Index calculation
  - Based on information monitored / simulated





Conclusion

- Its possible to derive conclusion about each environment with the indexes created
- Provide a clear summary of enviromnet indexes to increase user awareness
- Need to increase economical, environment and social measures in index's calculation

Future Work

- Adapt and deliberate in a constants environment changing on a timely basis
- Use monitored data to predict future trends and long term sustainability indexes
- Deliberate about efficient action planning using techniques from artificial intelligence

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