

**Completely modeling multidisciplinary city
management departments as they are
in order to achieve social resilience**

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Summary

- Introduction
- Main Projects
- Cooperations
- Some data aspects
- Conclusions

Main branches

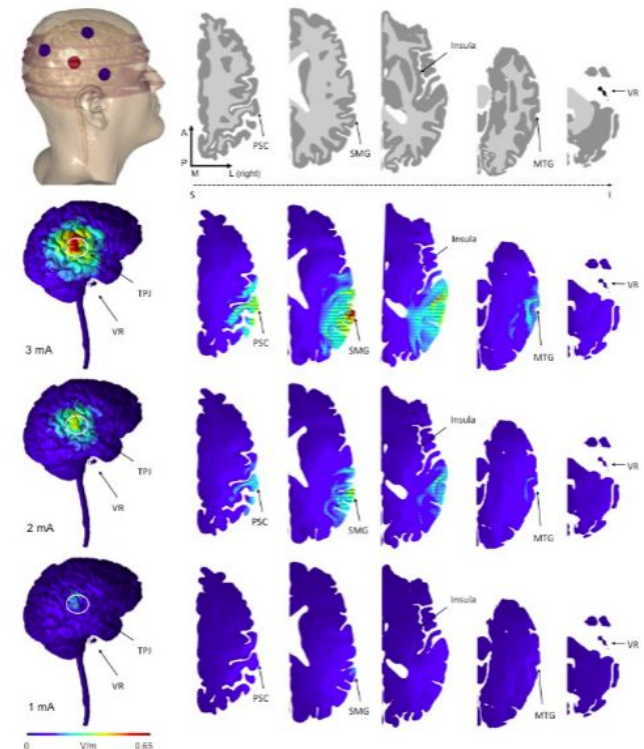
- Neurocognitive Engineering
- Healthcare Networks
- Epidemiology
- Citizen and Social Assistance
- Environment

Neurocognitive Engineering

- Sensors network together with stimuli devices
- Head/brain functional models
- Robotic rehabilitation
- Concerning Math, Computing and Statistics
 - Prediction
 - Optimisation of
 - Head models
 - Rehabilitation procedures
 - Learning environments

Current projects

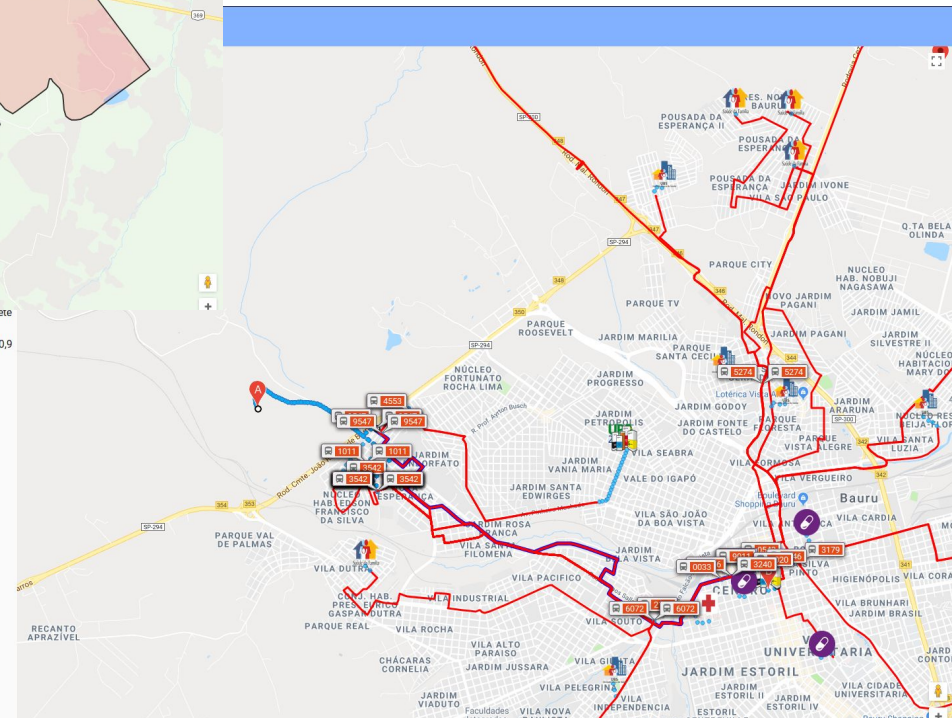
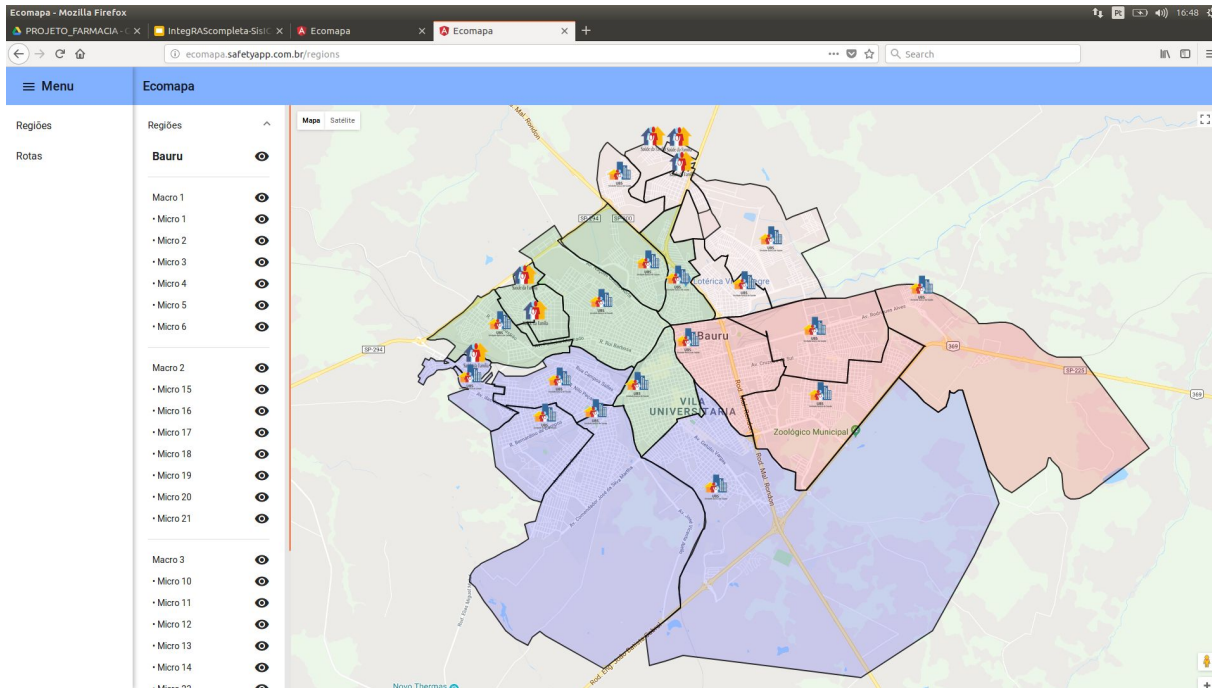
- Neurocognitive Engineering
 - Brain Computer Interface - BCI
 - Integrated and high resolution BCI
 - Aquistion
 - EECG
 - FMRI
 - Stimuli
 - HD-tDCS
 - BCI in Multidisciplinary Tinnitus Project
 - Diagnosis and Rehabilitation
 - Kiosks of Hearing Aid devices
 - **Pre-screening of a population**
 - Tinnitus setups



Healthcare Network

- Network of services for attendance of populations
 - Supply, storage and disposal of health products
 - Patient and practitioners flow in the network
 - Units or centres of health
 - Supernodes
 - Another network inside each node
 - A hospital
 - Another network
 - Interaction/integration among units
 - Data, products, professionals and patients
 - Real-time demands
 - **Social and demographic dependencies**

Healthcare units and accessibility



Healthcare Network

- Concerning Math, Computing and Statistics
 - Design of new computer devices to adequate price and quality
 - Technology to design system of systems
 - Automatic modeling of dynamic complex network
 - Data mining
 - Prediction
 - Optimisation of
 - Procedures
 - Flows
 - The network itself

Epidemiology

- Endemic disease control
 - Dengue Fever
 - Chikungunya, Zika
 - Mapping areas of risk
 - Aedes aegypti larvae concentration
 - No pre-screening
 - Diagnosis in healthcare units
 - Dengue fever test - Blood test
 - Control Actions
 - Emergency actions
 - Influenza

Social Assistance

- Mapping people with accessibility difficulties
 - Elderly
 - Blind
 - Addicted
 - Etc
- Assistance and Emergency Actions

Environment

- Mapping Sao Carlos city environmental condition
 - Water Quality
 - Pre-screening
 - CO₂
 - Solar radiation
 - Noise
 - Etc
 - Situation Room
- Climate changes
 - Predictions

Cooperations

neurocognitive engineering

- Cooperation agreements

- Centre of Engineering Applied to Health – USP
- Centre of Math Applied to Industry – FAPESP
- World Hearing Org. Corp. – USA
- International Brain Research Org. - European coordination
- WFGO Corp. - Iran
- Shiraz and Tehran Universities
- Hospital das Clinicas - Rib. Preto
- Institute Ganz Sanchez on tinnitus – Brazil

- Under negotiation

- CRIAR Sistemas Inteligentes Corp. – Rib. Preto / Brazil
- Soterix Medical Inc. – USA
- Cedrus Corp. – USA
- BRICS Multilateral Joint Science and Technology Research Collaboration

Cooperations healthcare network

- Cooperation agreements
 - Hospitals
 - Emergency Centre - Rib. Preto / Brazil
 - PIPE-FAPESP
 - Centre of Math Applied to Industry – FAPESP
 - Teaching Hospital of Federal University of Sao Carlos - Brazil
- Under Negotiation
 - Special Services on Health of Araraquara – SESA - Brazil

Cooperations

epidemiology / citizenship / environment

- Cooperation Agreements
 - Cooperation with Dep. of Epidemiology of Sao Carlos city
 - Cooperation with Dep. of Citizenship and Social Assistance of Sao Carlos city
- Under Negotiation
 - Cooperation with Dep. of Environment, Science, Technology and Innovation of Sao Carlos city

Some data Aspects

- Regions involved
 - Areas and population
- Protocols
 - Standard **X** Used
- Databases
 - Inconsistency
 - Non-well structured
 - Difficult to find data correlations
 - Unstructured data
 - Space-time resolution
 - Data sharing
- Processes that are used but not formalised
 - Field investigation

Conclusion

- Cooperations enabling
 - As-Is
 - Modeling
 - **Multidisciplinary systems**
 - To-Be
 - Evolutionary construction
 - Data lake
 - Cost versus performance
 - **Evolutionary Multidisciplinarity**
 - Social, Environment and Economic equilibrium

Conclusion

- Complete Multidisciplinary modeling can enable
 - Simulations
 - Predictions
 - System optimisations
 - Cost-Benefit tradeoff
- UN Sustainable Development Goals

Thanks

FAPESP

Warwick University