



# CREW



## Cognitive Radio Experimentation World

### GAME-COG-NET

Game Theoretical Experiments on Interference Coordination in Cognitive Radio Environments

Technical University of Cluj-Napoca

#### Goals

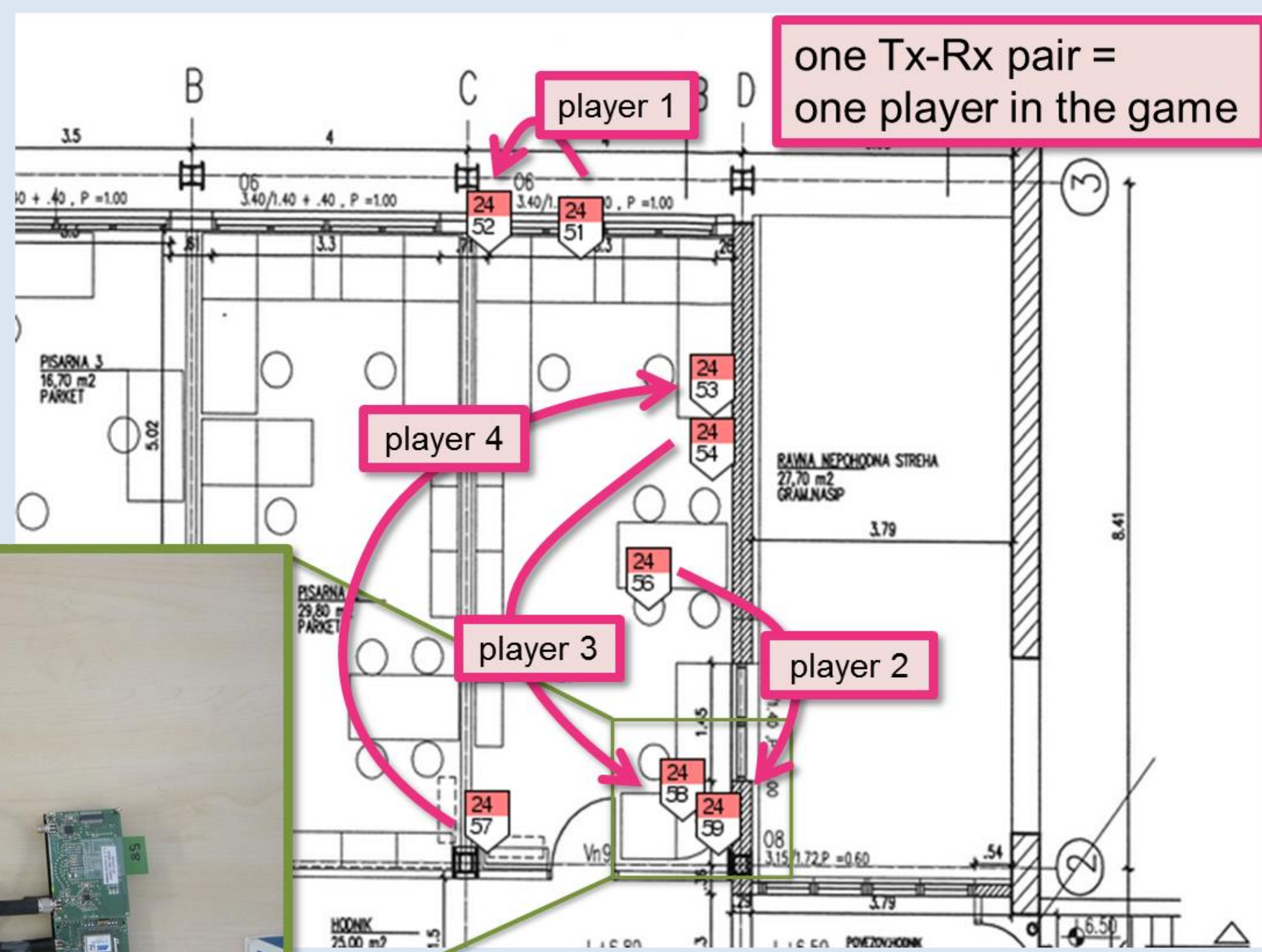
- ❖ Validate a distributed, interference-aware power control algorithm, motivated by Game Theory.
- ❖ Study cognitive radio interactions in a real-world testbed through a game that considers interference between nearby networks and energy efficiency.

#### Challenges

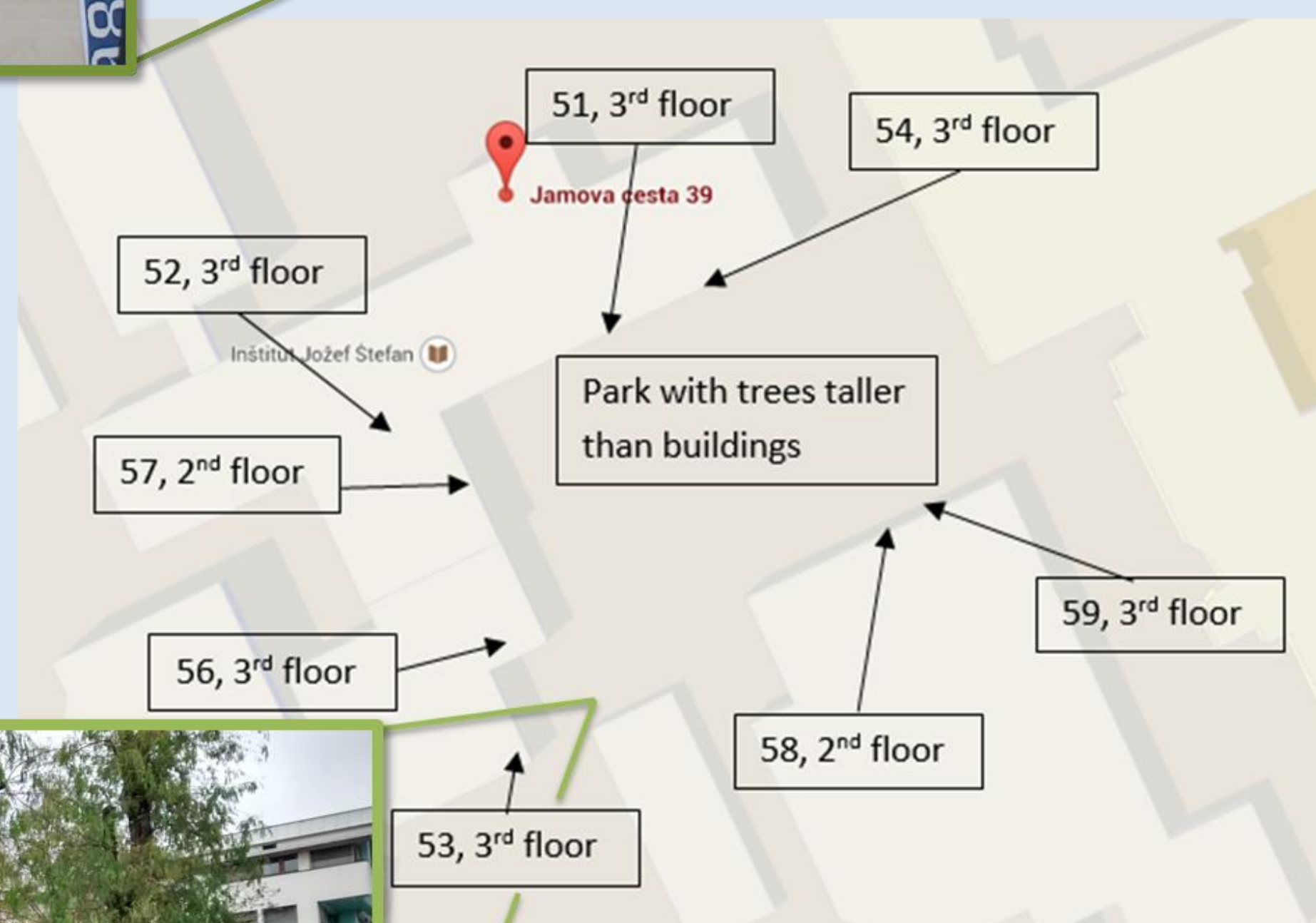
- ❖ Identification of experimental set-up constraints.
- ❖ Adaptation of the theoretical framework for the use in a real-world testbed rather than in a simulation scenario.
- ❖ Empirical determination of parameters such as channel gain.
- ❖ Implementation and experimental evaluation.

#### Testbed setup

In-door

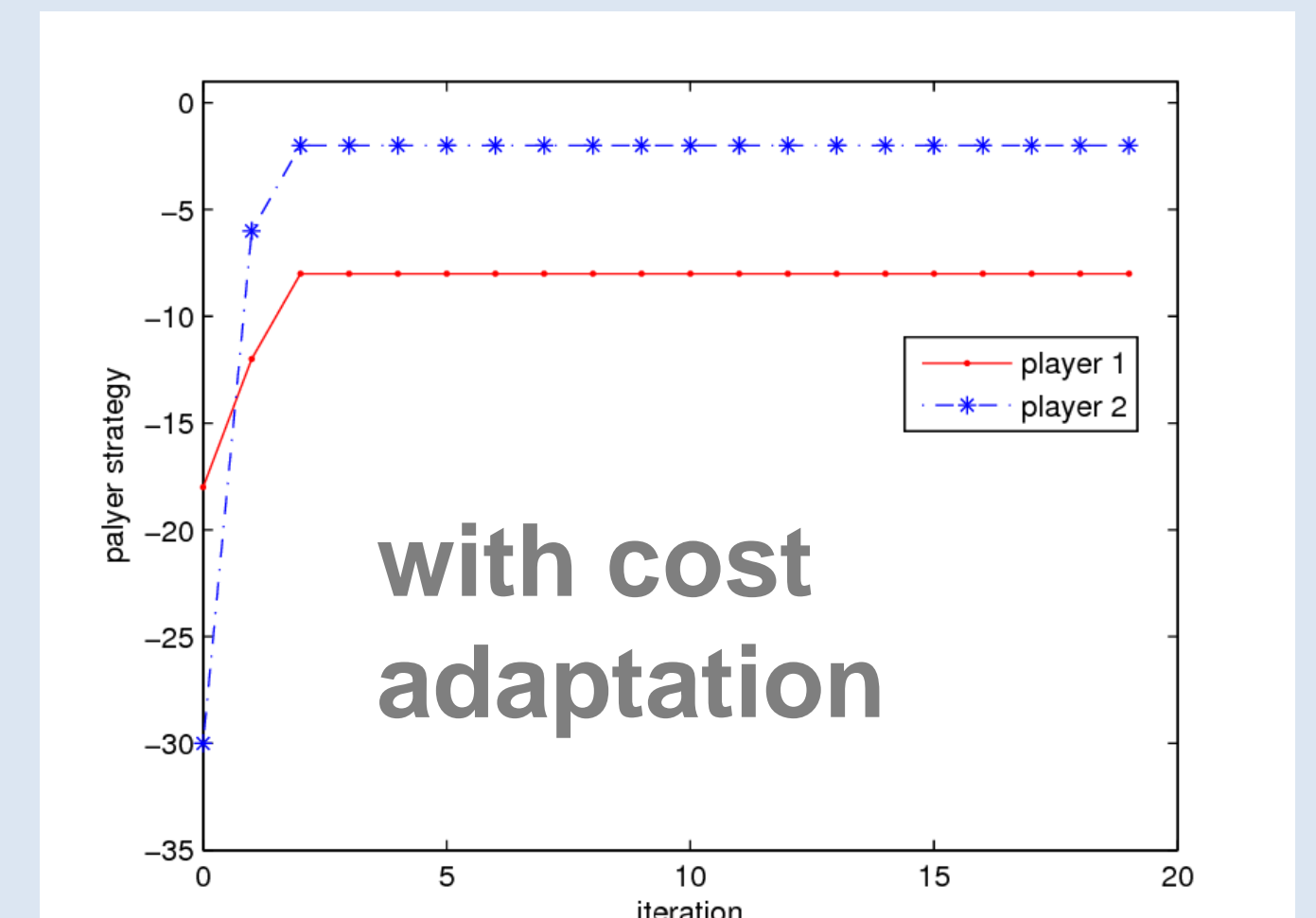
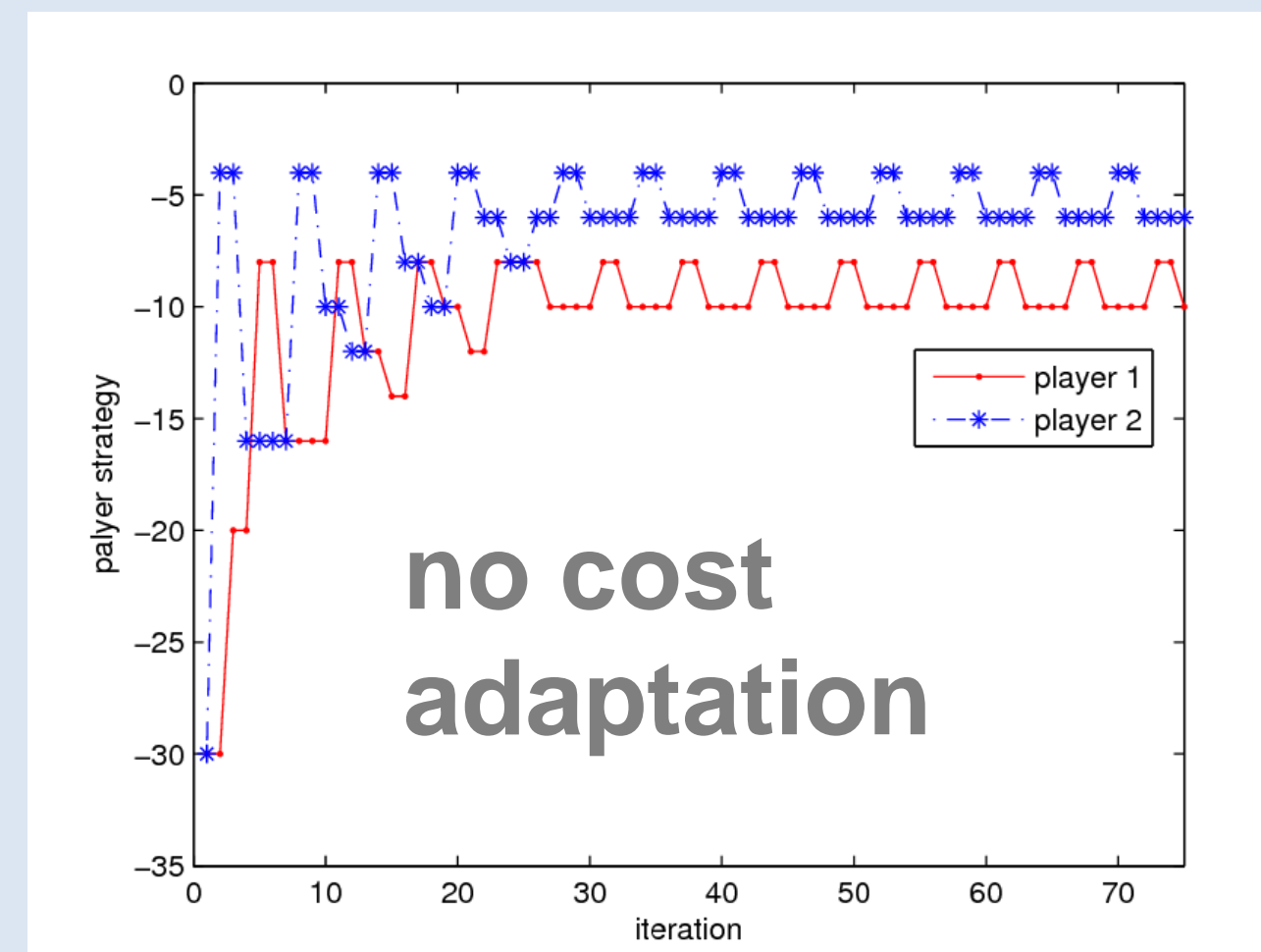


Out-door

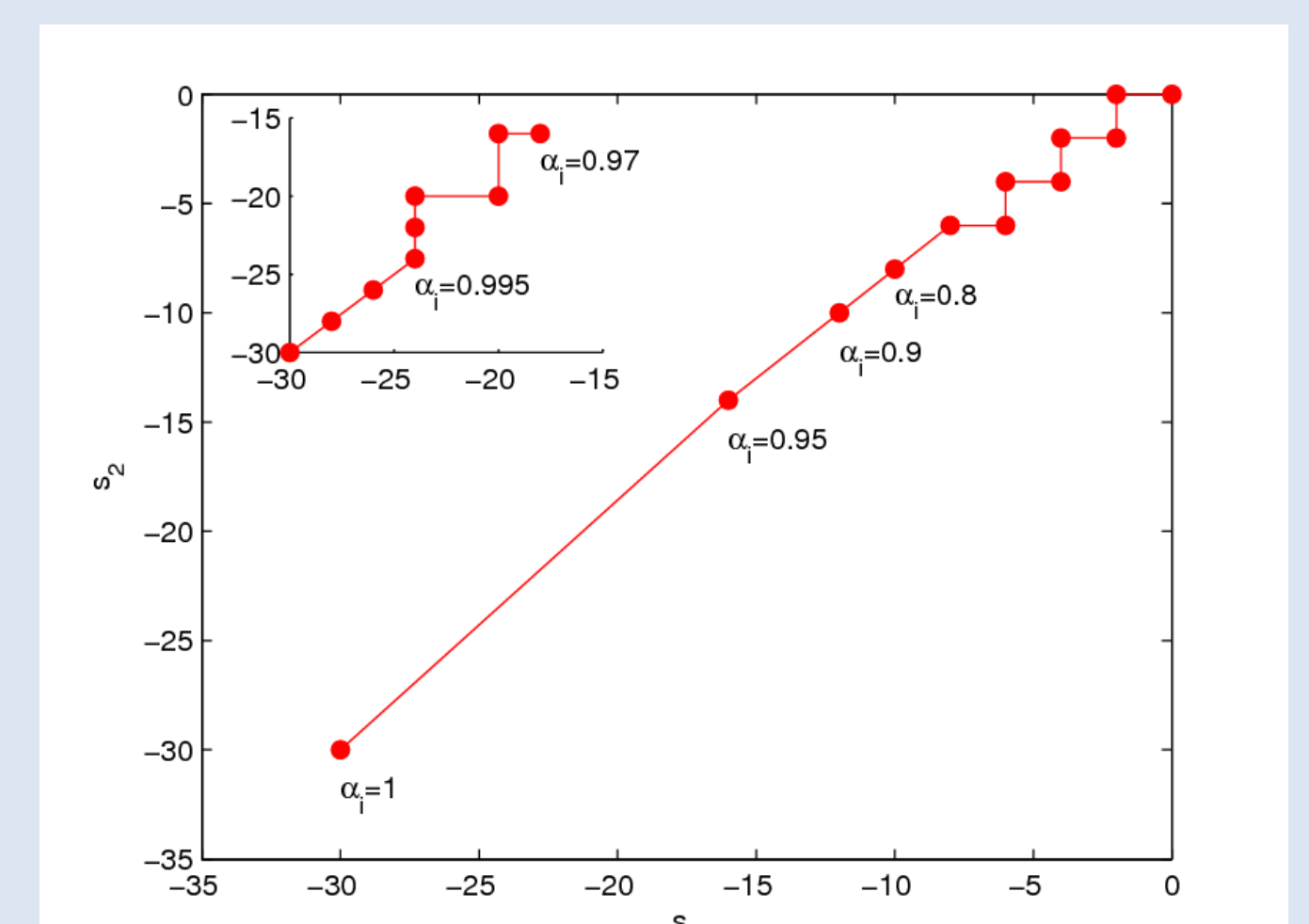
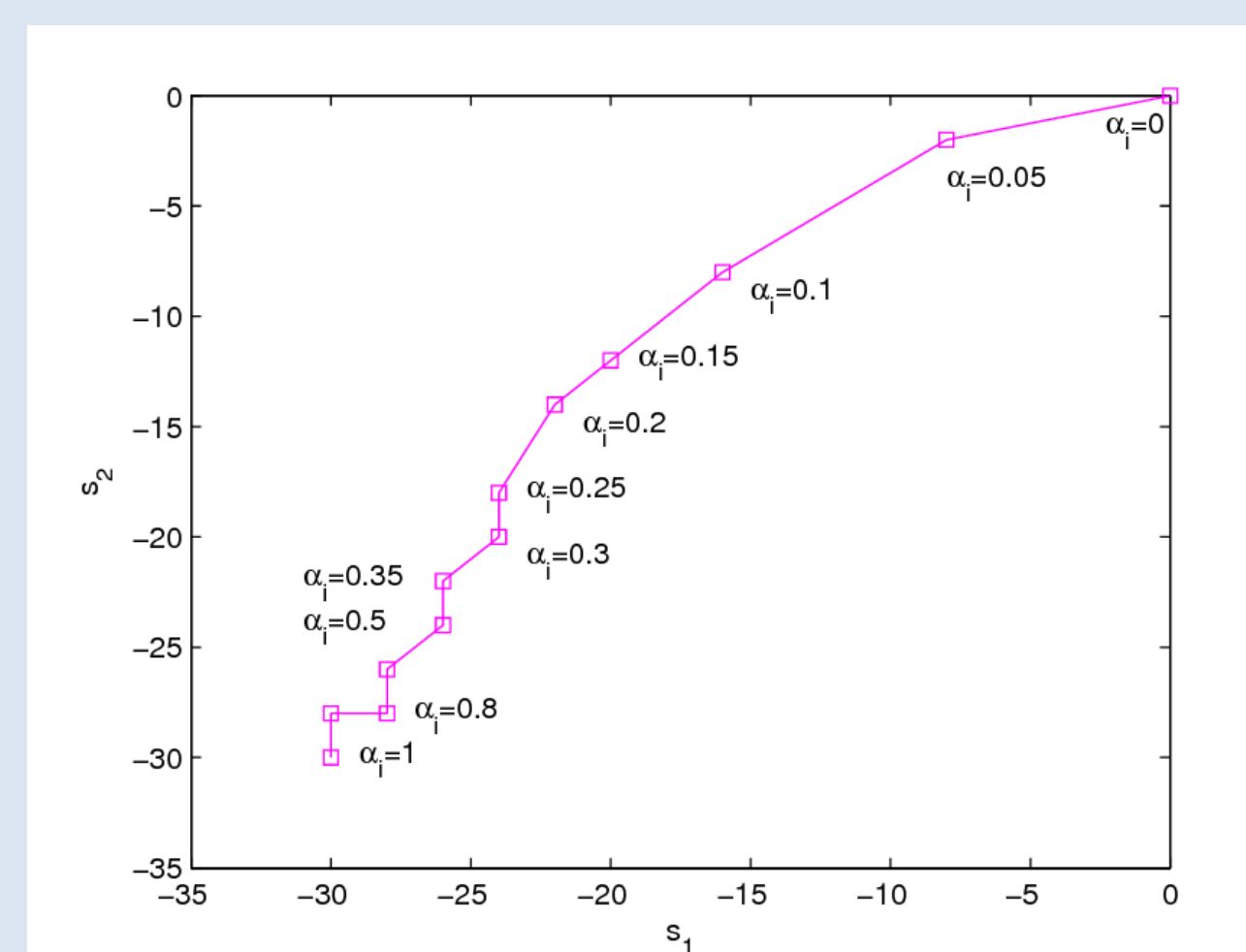


#### Results

- ❖ With a fixed cost function, player transmit powers oscillate when transmit power levels are constrained to discrete values by commonly used hardware. This results in variations in QoS.
- ❖ With dynamic cost, a stable state is consistently reached.



- ❖ Effect of cost adaptation parameter  $\alpha$  and interference estimation method on player strategy was studied.



#### Conclusions

- ❖ Successfully implemented a power control algorithm using the hardware and software provided by LOG-a-TEC testbed.
- ❖ Measured effect of adaptive cost on speed of convergence.
- ❖ Measured effect of cost adaptation parameter  $\alpha$ .
- ❖ Tested the behavior and stability of the system when players enter and leave the game dynamically.

#### Testimony

- ❖ LOG-a-TEC testbed allowed for easy deployments of new testbed clusters in cases where existing clusters did not have correct geometry for an experiment.
- ❖ Hardware provided by the testbed was very similar in capabilities to a commercial wireless sensor network.
- ❖ CREW team has been supportive during the experiments



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#### PROJECT DATA

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