**Abstract**

We propose a networking action to unify and cement a lively European-wide research environment for research on logic, games and automata. In the last decade these three areas have witnessed rapid growth accompanied by appearance of new important concepts and techniques. We feel that at this stage of development of the three fields, a strong impact can be achieved by a dedicated forum to present the best results in these domains, together with a coordinated action support for scientific collaboration and mobility.

The main part of the proposed action will be a yearly scientific meeting called "Highlights of Logic, Games and Automata". This conference will be based on a novel (for computer science) organization principle: the conference will consist of presentations summarising the best work that has been presented at other venues, without published proceedings. We are requesting funding for the first four years of this conference. After the funding ends, we hope that the conference will be sufficiently established to continue indefinitely.

Apart from the conference, we propose to organise 3 schools for PhD students. Also we intend to fund short visits of up to 4 weeks for young researchers, especially PhD students.

**Background, problems**

The connected topics of logic, automata and games have grown in importance within the theoretical science community. They now form a recognisable cluster, with researchers combining techniques from all three topics. More specific areas where at least two out of the set {logic, automata, games} include:

*• finite model theory*

*• parity games*

*• stochastic games*

*• the algebraic theory of regular languages*

*• languages with infinite alphabets, as used in databases*

*• languages of infinite words and trees*

*• constraint satisfaction programming*

*• temporal logics*

*• algorithmic theory of infinite structures*

The importance of this cluster of topics is illustrated by its frequency in some of the top conferences in theoretical computer science. For LICS 2011, the cluster covered roughly 18 out of 37 papers; for LICS 2012 this fraction was 25/63, for LICS 2013 this fraction was 31/57, for ICALP track B 2012 this fraction was 20/31, for ICALP track B 2011 this fraction was 15/29. For ICALP track B best papers in 2003-2012, the fraction is 8/10. For PODS, STACS, MFCS, FSTTCS, CSL, ICDT the fraction is smaller. For the Ackermann Award, awarded for dissertations on logic in computer science, the fraction is 5/11.

In view of this importance, and the strongly interconnected nature of the cluster of topics, it is surprising that it does not have yet a permanent dedicated forum. Currently, papers on these topics are dispersed across conferences such as LICS, ICALP, PODS, STACS, MFCS, FSTTCS, CSL, ICDT. It is impossible to visit all of these conferences in one year. We feel that there is an urgent need to create mechanisms which facilitate exchange of ideas: an annual conference, training schools for PhD students, and short exchange grants for young researchers.

**Benefits, Objectives, Deliverables and Expected Scientific Impact**

The primary objective of this project is to organise a new conference, called "Highlights of Logic, Games and Automata", which unites these topics, allows the best papers concerning the above topics to be presented in one place even if they might have been already published elsewhere and, most importantly, allows researchers specialised in one of the above topics to meet each other. This new conference will not compete with the established conferences as a publication venue; it will exclusively serve the purpose of dissemination and will have no published proceedings.

A secondary objective is organisation of 3 schools for PhD students, to tighten the links inside the community. Also, we will fund short (1-2 weeks, at most 4 weeks in exceptional cases) visits for young researchers; the idea is that if two young researchers discover a connection, then they can meet to discuss it in more detail. We do not intend to fund longer visits, these will be funded by dedicated research projects on more specialised topics.

The topic of logic, games and automata is well established in the EU, where many of its current leading researchers live. The new meeting would help establish EU leadership in this topic.

We believe that a COST Action could provide the necessary momentum to establish a new type (for computer science) of conference, which would rationalise the conference system for a distinct community (logic, games and automata) inside theoretical computer science.

**Scientific Programme and Innovation**

The goal of the project is to develop the connections between logic, games and automata. Below we list some of the already established connections, which show the cohesiveness of the fields. We hope that the new conference will allow us to discover new connections.

• Games, especially parity games, have proved to be fundamental to the understanding of languages over infinite objects, especially infinite trees

• Automata on infinite trees have been used as algorithmic tools for solving games on infinite graphs as well as multiplayer games

• Automata with boundedness conditions have been independently developed in formal language theory (the star height problem) and in verification-oriented logics. The underlying ideas from semigroup theory have also lead to new algorithms for probabilistic automata.

• Algebraic techniques are behind breakthrough results on the dichotomy conjecture in constraint satisfaction programming

• Infinite alphabets, and automata over them, have been used to solve problems in both verification and database theory.

• Many synthesis and verification methods for temporal logics are based on automata on words and trees. This has driven much development in automata, e.g. new determinization and complementation algorithms.

• An algorithmic theory of infinite structures is the basis for verification of systems that cannot be modeled by finite transition systems. Finite automata (on finite and infinite words and trees) are an important tool for symbolic representations of infinite structures and many decision procedures are based on algorithms for such automata.

**Organization**

If the Highlights meeting is successful, then instead of going to multiple conferences, one will only need to go to this meeting. There is a circularity problem: to be successful, Highlights must be well attended; to be well attended, Highlights must be successful. We hope that in the future, Highlights will be so important that people will always find the time to come; if only because they will no longer need to go to so many other conferences. In the beginning however, special incentives are needed. This influences the following design decisions:

• The venue is a city like Paris or Amsterdam that is easily accessible from all larger European cities.

• There are no published proceedings, and work published elsewhere can be presented. This encourages people to present their best work during the year, regardless of whether it has been already published or presented, and regardless of how many papers it was split into.

• Excellent keynote speakers are invited.

• The conference fee is lower than at other conferences (free or less than 100€).

• There is travel support, especially for students.

We would like to use the COST Action money for the last three items. The conference will also be open but not subsidized for researchers outside the project (the fee will be reasonable for external participants as well).

The main precedent for the Highlights conference is an annual workshop called "Games", without proceedings, which surveyed the progress in the field. This workshop ran in 2002-2012, funded first by FP5 and then by ESF, and is now over due to end of funding. The workshop was always attended by at least 80 participants, showing high interest in an informal meeting without proceedings. It is mainly thanks to the interactions created by the "Games" workshop that we can speak of the cluster of topics in this proposal. The Highlights conference copies many ideas from the "Games" conference, especially the lack of proceedings. This year, in September 2013, we intend to organise a first edition of the Highlights conference, this first edition will not benefit from the COST action.

For the PhD schools, we intend to follow the model established by the “Games” programme in 2002-2012: week-long schools, with around 6 speakers, and up to 100 participants. We intend to organise 3 of these schools.