Example Harvest Project Proposal

Project general information

Title	**Acoustic Roadrunner Detection and Tracking**
Coordinator	Prof. Wile E. Coyote, Warner Bros University (w_coyote@cs.wbu.ac.uk)
Participants	Mr. Jeremy Pet, PhD Student, WBU Ms. Hanna Hardware, ACME PLC Dr. Barbera Ironsmith, ACME Research
Hosting site	Warner Bros University, Computer Science Department, Wolfhampton, UK
Expected dates	July 1st, 2009 – August 31st, 2009

Problem description

Roadrunners are well known for the quality of their meat, which can be tastefully prepared roasted and stewed. Its nutritional properties make it the favoured meal to most Coyotes. As a matter of fact, however, the substantial speed at which roadrunners move, together with their impressive obstacle avoidance skills, turned down all attempts so far to hunt or trap them.

We believe that existing Machine-Learning methods are sufficiently mature to provide an answer to this challenging problem, helping at least in the following areas:

- Automatic recognition of roadrunners in camera images
- Modelling of roadrunner behavioural patterns
- Acoustic detection of roadrunner passage

Considering the limited time and resources involved in a harvest project, and the fact that other general-purpose tools already provide some basic functionalities for the first two tasks, this project will focus on the third aspect.

Roadrunners produce a distinctive “beep-beep” verse when running, usually followed by a loud “whoosh” sound. It is generally believed that these features, and possibly other acoustic patterns, could be used to learn discriminative models of roadrunner passages. To the best of our knowledge, however, no experimental evidence of this has been gathered, and this would represent original research.

The expected output of the project is a software for categorizing sound signals in near real-time into “roadrunner passage” and “not roadrunner passage”.

General requirements for the software which constitutes the expected output

It is expected that the software will eventually be installed on solar-powered small workstations in the middle of the desert. While a final commercial version will probably need to be coded in the BARK++ programming language for solar-powered desert-deployed embedded systems, no programming language requirement is set at

this stage. Memory limitations (< 200Mb RAM footprint) will however need to be taken into account. Also, considering the running speed of road runners, the time required by the classifier to perform inference should not exceed 3 milliseconds on a standard ACME workstation, or the prediction would be voided of any value.

Visibility afforded to PASCAL

The project will create and maintain dedicated pages on the PASCAL2 Wiki, and a video documenting usage of the prototype will also be made available for promotion purposes.

Method that will be used to asses performance, together with relevant datasets

The project will exploit the extensive database of roadrunner passage recordings (23,499 data points) gathered in the WBU dataset, which will be complemented by additional 400,000 audio tracks of other desert trail events recorded by ACME research to be used as negative examples. A fraction of this datasets will be set aside for evaluation. Performance will be assessed in terms of Precision and Recall on this test set. A precision of 95% at a Recall level of 30% would be considered sufficient by ACME to proceed to the engineering and the integration of the recognizer into its "ePoaching" platform.

Milestones

D5: agreement on learning algorithms to test. Test suite ready.
D8: software architecture defined, assigned responsibilities for different components;
D10: Communication protocols between modules fully specified
D15: Straw-man system in place (stubs for modules)
D40: At least two alterative classification algorithms implemented and tested
D60: Code documented and proofed for memory leaks and dynamic memory accesses. Technical report complete. Project ends.

Team composition

Prof. **Wile E. Coyote** is chair of Imaginative Pursuit Methods at the Warner Bros University. After earning a PhD in ornithology at Cambridge, UK, he spent several years performing field work in the Nevada desert. Since 2005 he developed an interest for Machine Learning methods in Roadrunner tracking, on which he published several research papers.
Mr. **Jeremy Pet** is a graduate student in Imaginative Pursuit Methods at Warner Bros University. He earned a MSc in Computer Science at the Nevada State University, with a specialisation on acoustic modelling.
Ms. **Hanna Hardware** is chief software engineer at ACME. She is a specialist in solar-powered desert-deployed embedded system, and is in charge of advanced development for the ACME ePoaching team.
Dr. **Barbera Ironsmith** joined ACME Research in 2008 after earning a PhD in Pattern Recognition at the University of Bristol, with Prof. Nello Cristianini. She is since a member of the Cognitive Systems group where she works on machine learning methods for acoustic processing and on four-point spikes.

Requested funding

The project requires funding travel and subsistence for two months of Ms. Hardware and Dr. Ironsmith to Wolfhampton:

	Unit Cost, €	**Qty**	**Cost**
Return flight to Wolfhampton	356	2	712
Per diem	138	120	16560
Participation to Harvest workshop	700	2	1400
Total			**18672**

Content of the training that will be delivered to participants

Prof. Wile E. Coyote will deliver lectures on:

- Off-cliff running
- Fast recovery from high-speed body-rock impacts
- Explosives blowing

A one-day practical training on four-pointed anti-tire anti-roadrunner-leg spikes will be organised by Dr. Ironsmith.