

## Model for Software Automatic Tuning

Takahiro Katagiri (The University of Tokyo) katagiri@cc.u-tokyo.ac.jp

**1. Aim of This Research:** The structure, functions, hierarchy, and object levels for Automatic Tuning Facility (ATF) are defined and explained.

**2. The Structure:** The ATF has four kinds: AT Candidates Accumulator; Monitor; Machine Learning; Parameter Estimation. For the facilities, there are interaction between users, such as invoking monitor and estimation. The monitored performance is stored into database. The data on database is used to estimate the best parameter value through machine learning facility. The overview of the structure is shown in Fig.1.

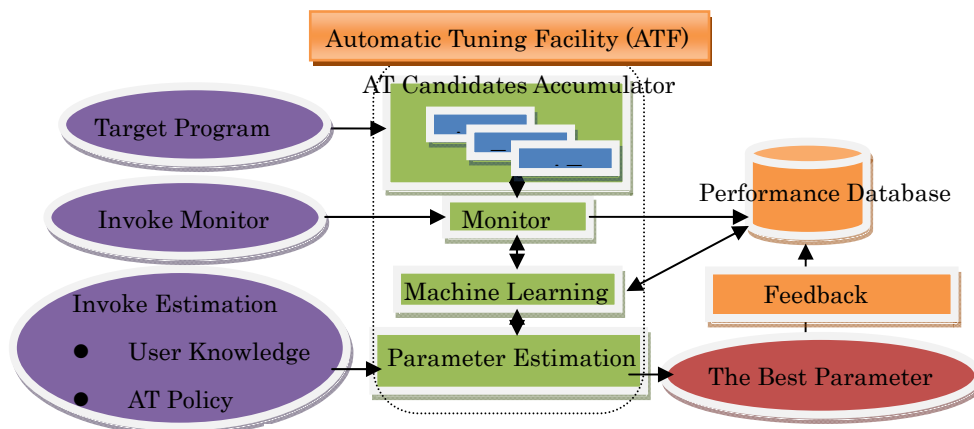


Fig.1 Structure of Automatic Tuning Facility.

**3. The Functions :** There are four essential functions in ATF: Code Generation; Target Execution; Model Fitting; Parameter Search; The code generation function generates the candidates of AT from a given user program. The target execution function executes the best candidate with estimated best parameter. Measured performance is also stored to database. Model fitting function determines performance model according to machine learning facility. Finally, parameter search function finds the best parameter by using the determined performance model. The function also judges finalizing AT procedure.

**4. The Hierarchy:** There are many hierarchies for AT. The follows are the abstraction: [Time Hierarchy] For Invoking ATF: *Static AT*; *Dynamic AT*; For AT Software Usage: *Install-time*; *Before Execute-time*; *Run-time*; [Object Levels] Application; System Software; [Object Granularity Levels] Problem; Formula Description; Algorithm; Element program; Job;

### References:

[1] T.Yuba et.al : A Survey of Research Topics on Software Automatic Tuning Technology, Auto Tuning Research Group, pp.6-13, November 2008. In Japanese.