

# A Demonstration for Focusing on Separation of Debugging Concerns based on Dynamic Program Rewriting Tool: Piggy's Weaver

Ikuta Tanigawa  
Tokai University

Nobuhiko Ogura  
Tokyo City University

Midori Sugaya  
Shibaura Institute  
of Technology

Harumi Watanabe  
Tokai University

## Abstract

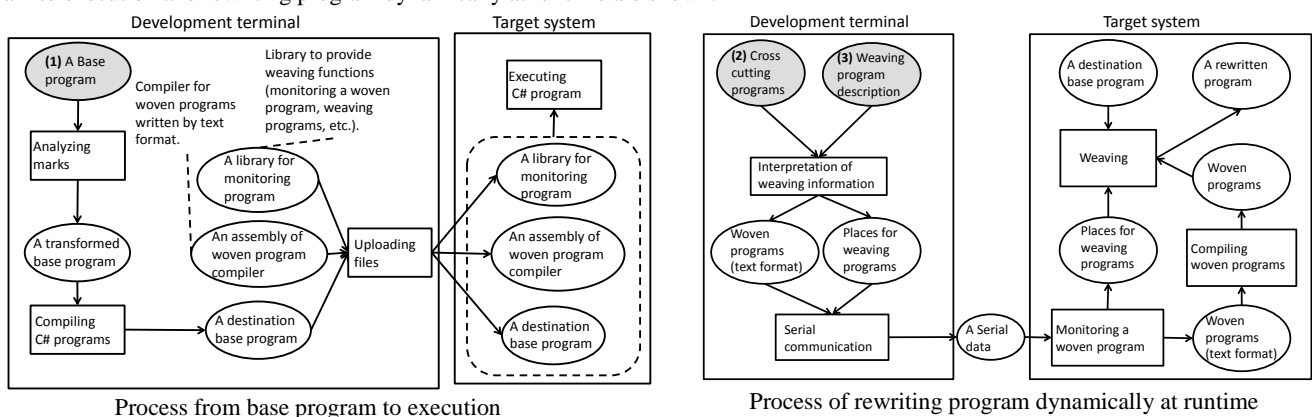
Dynamic program rewriting is needed to continuous work and reduces costs of maintenance. We propose a dynamic rewriting tool "Piggy's Weaver" for C# program. The tool attaches and detaches pieces of code to program at any points on each concern. Especially these attachments are focused on debugging concern. In the demonstration, we will apply the tool to a cloud and embedded system "Piggy Net" which is a cooperating charity pot with SNS and was awarded 2nd prize on D2C2012 by Microsoft Japan.

## 1. Introduction

Prototyping methods on embedded software are useful in initial stage of development process for evaluating algorithms of system behavior by trial and error. The period for the development process is desired to be short as possible. Whenever rewriting programs, we need to restart the system. For restarting, we must stop system, upload software, and occasionally link network. We meet often opportunities of rewriting programs. Therefore, the cost for rewriting is not small. Moreover, the resuming system is impossible to behave as same states before stopping, since embedded software receives influence from various and complicated environments. To overcome these restarting problems, we develop a tool for dynamic program rewriting at runtime. The name is Piggy's Weaver.

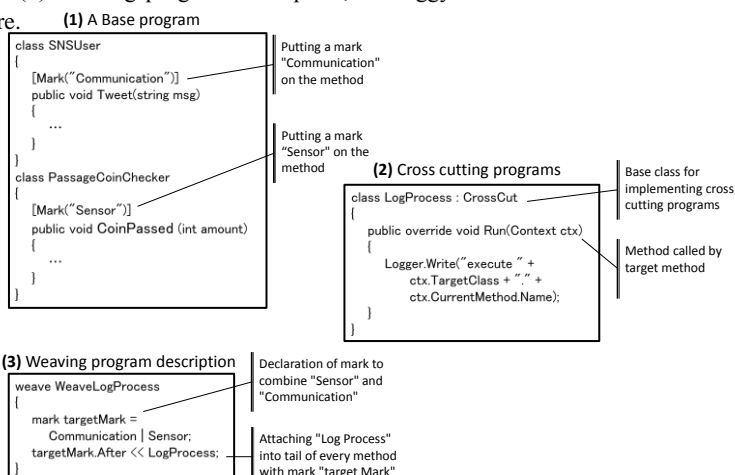
## 2. Piggy's Weaver

Piggy's Weaver can be rewritten program for corresponding crosscutting concerns. The tool consists of a development terminal and a target system. On the development terminal, programmer writes (1) base program (2) crosscutting program description and (3) weaving program description. Base program can be attached marks as point-cuts with C# annotation. Each mark is related to cross cutting concerns, such as debugging processes or exceptions of communication. Cross-cutting program descriptions are inserted to marking points on base program. Weaving program description is mapped marks on base program into cross-cutting program descriptions. In the following, the process from base program to execution and rewriting program dynamically at runtime are shown.



## 3. An Example of Program

An example of 3 pair of programs (1) base program, (2) cross-cutting program description and (3) weaving program description, for Piggy's Weaver is shown in the following figure.



## 4. Demonstration and Evaluation

On the demonstration, we will modify cross cutting program pieces at runtime by Piggy's Weaver. The target system is called Piggy Net which is cooperating charity pot with SNS. To evaluate Piggy's weaver tool, we will show you that SNS connection is continuing after modifying programs.

