GB21802 - Programming Challenges

Week 0 - Introduction

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2016/4/15
(last updated: March 1, 2017)

Before Anything else: Important Notices

Manaba Page

All lecture notes and announcements for this course will be done through MANABA. Access the url below:

`https://manaba.tsukuba.ac.jp/ct/course_427760`
Registration Code: 4004466

Language

- Lectures: Japanese
- Slides and materials: English
- Exercises: English
- Questions, Mails and Homework: Any language

About the Lecturer

- Name: Claus Aranha;
- Country: Brazil;
- Research: Artificial Intelligence, Genetic Algorithms, Deep Learning;
- Language: Python, R;
- Hobbies: Game Programming, Geocaching, Twitter Bots;
- twitter: @caranha
- webpage:
  `http://conclave.cs.tsukuba.ac.jp`

What is this course about?

You have learned many programming techniques...

...but can you use them?

Course Philosophy: Learning by Practice

- Every week, you will be asked to solve some programming problems;
- You have to decide the best data structure, and technique to solve each problem;
- Each problem has a max time, and max memory;
- We will discuss some techniques and tricks;

Course Goal:

Improve programming abilities, techniques and familiarity.

Why you should do this class

- You learned a lot of programming theory, but you need more programming practice;
- You have not written many programs yet;
- You want to think about program efficiency;
- You want a class where skill is more important than memorization;
- You want to practice your technical English;
- You want to participate in Programming Contests;

Warnings about this class

1- Heavy Workload

- Challenges start easy, but end very hard;
- Expect to use a few hours per week on homework;
- Lots of debugging;

- Hint: Do your homework early!

2- Course Language

- All the course materials are in English;
- Importantly: All the homework is in English;
- You can submit your programs/questions in Japanese;

- Practice some English in this course too! :-)

What is a “Programming Challenge”?

A programming challenge is a puzzle that can be solving by making a computer program.

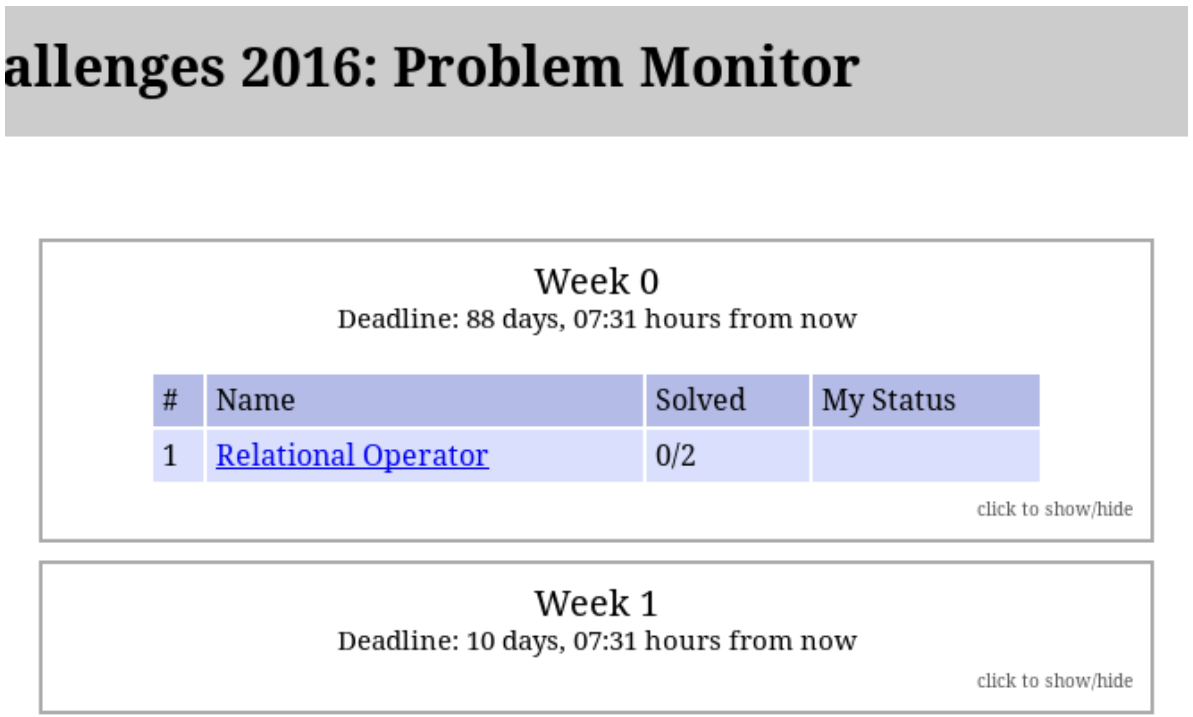
The challenge describes the inputs and the rules of the problem, and you must write a program that finds out the correct output.

Let’s see an example.

Example Challenge: “Relational Operator” (1)

The challenges for this course are listed at the page:

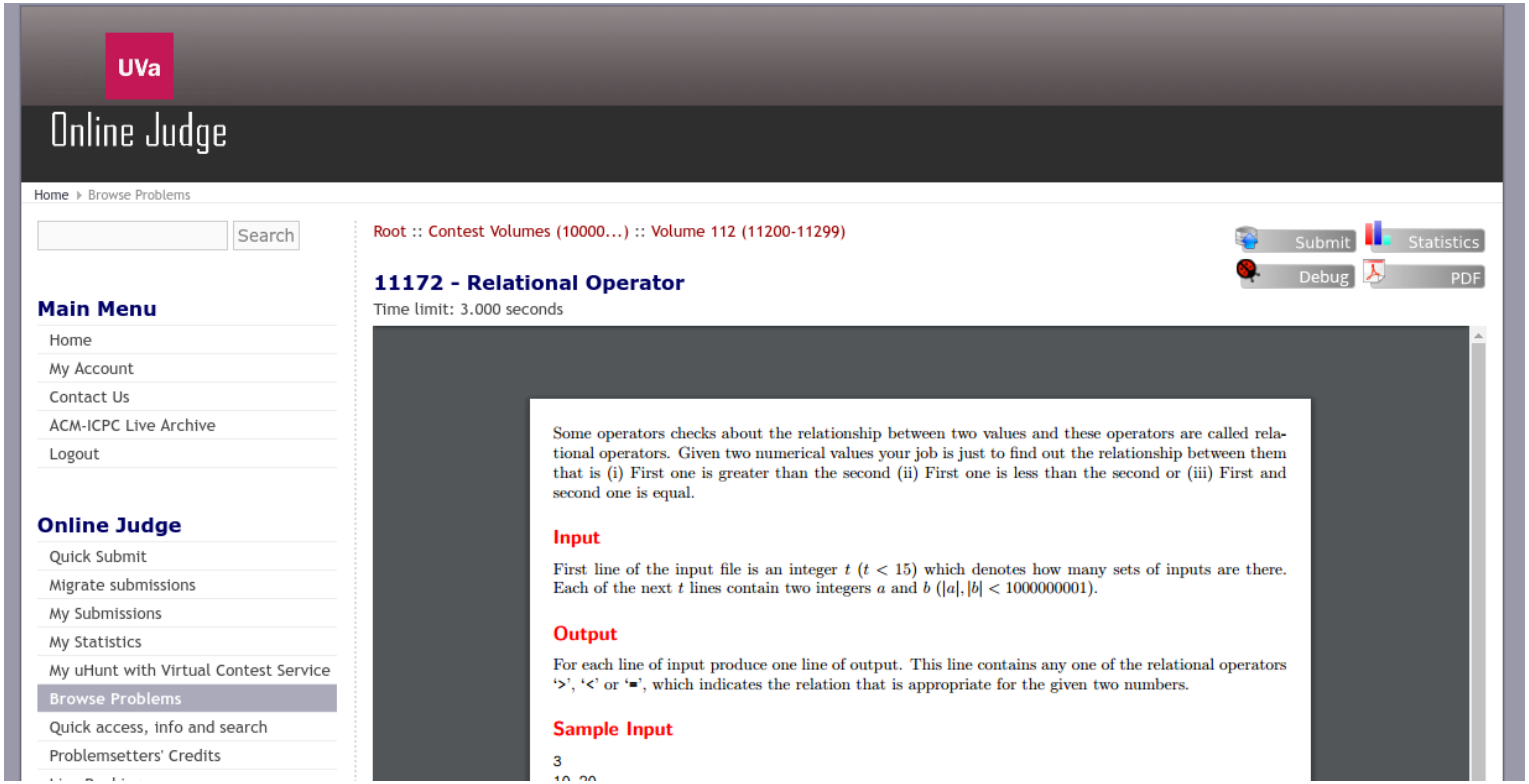
`http://conclave.cs.tsukuba.ac.jp/lecture/monitor.html`



Click on the title to go to the problem page.

Example Challenge: “Relational Operator” (2)

Clicking on the title will take you to the problem page.



Here you can read the problem and submit a solution.
(You will need an UVA account!)

Example Challenge: “Relational Operator” (3)

Problem Description

Some operator checks about the relationship between two values, these operators are called relational operators. Given two numerical values, your job is just to find out the relationship between them. That is (i) First one is greater than the second, (ii) First one is less than the second or (iii) First and second one is equal.

Input

First line is the number t of tests ($t < 15$). Following t lines are two integers a and b.

Output

For each line of input, print one line of output with ’>’,’<’ or ’=’, according to the relationship of a and b.

Solving “Relational Operator”

```
// UVA 11172 - Relational Operator
// Test if a is bigger, smaller or equal to b

#include <iostream>
using namespace std;

int main()
{
    int n; long a, b;

    cin >> n;
    for (; n > 0; n--)
    {
        cin >> a >> b;
        if (a > b) cout << ">\n";
        if (a < b) cout << "<\n";
        if (a == b) cout << "=\n";
    }
}
```

How to submit a problem

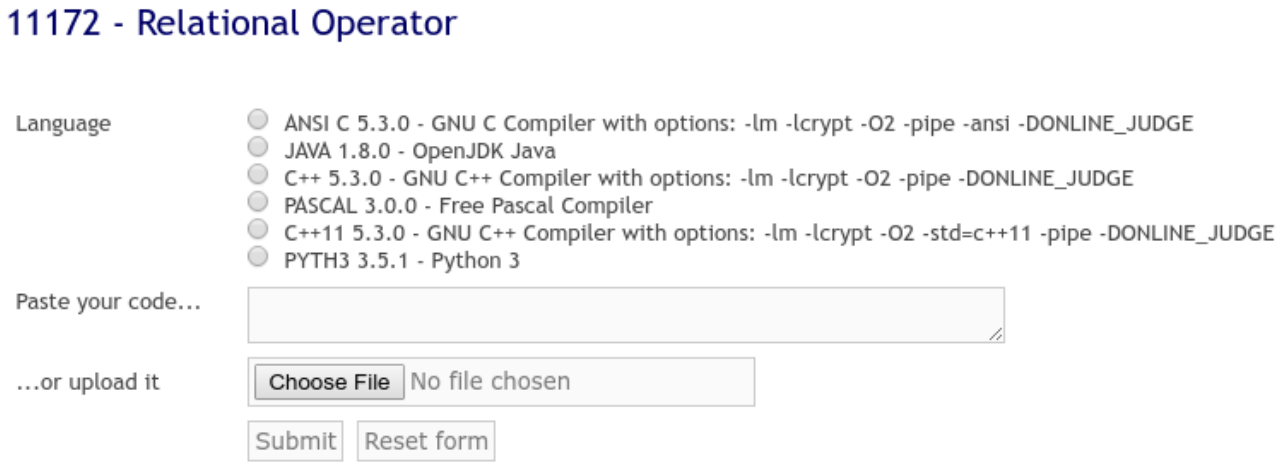
After you finish your program, and make sure it is correct, you can submit it.

Problem submission has two steps:

1. Submit the problem to the UVA online Judge;
2. Submit the problem to MANABA;

Submitting the problem to UVA (1)

UVA is an Automated Robotic Judge. It will test your program on a set of inputs, and check if the outputs are correct.
From the problem page, click on the submit button.



Select your language, choose the file, and press submit.
(You can use C, C++, Java, Python and Pascal)

Submitting the problem to UVA (2)

After you submit the program, the judge will output one of the following results: Accepted, Wrong Answer, Time Limit Exceeded, Memory Limit Exceeded, Runtime Error, etc.

My Submissions

#	Problem	Verdict	Language	Run Time	Submission Date
17182419	1124 Celebrity jeopardy	Accepted	C++	0.000	2016-04-11 06:42:30
17181459	10141 Request for Proposal	Compilation error	C++11	0.000	2016-04-11 01:36:46
17181444	11498 Division of Nlogonia	Accepted	C++11	0.000	2016-04-11 01:30:43
17071417	102 Ecological Bin Packing	Compilation error	C++11	0.000	2016-03-23 09:21:55
17070667	161 Traffic Lights	Accepted	C++	0.000	2016-03-23 07:24:56
16607686	489 Hangman Judge	Accepted	C++	0.349	2015-12-20 03:52:45
16607670	489 Hangman Judge	Wrong answer	C++	0.335	2015-12-20 03:47:01
16607649	489 Hangman Judge	Runtime error	C++	0.000	2015-12-20 03:40:51

You can see this information on the “my submissions” page.

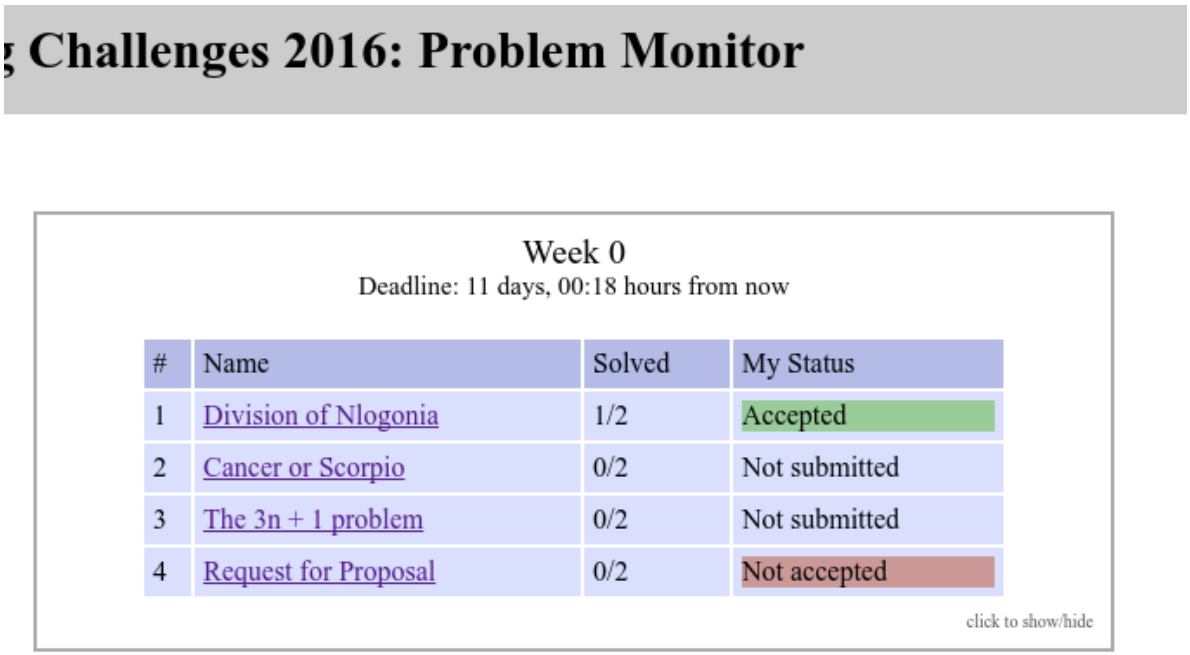
Submission Statues:

- Accepted: Your program is correct! Congratulations!
- Wrong Answer: Your program is incorrect. Debugging time.
- Time/Memory limit exceeded: Your program is inefficient. Think more.
- Runtime Error: Your program is crashing. To the debugger!

We will see how to deal with some of these problems in the next class.

Back to the problem Monitor

In the problem monitor page, you can check how many people solved each problem, which problems you still have to solve, and the deadlines.



; Challenges 2016: Problem Monitor

Week 0

Deadline: 11 days, 00:18 hours from now

#	Name	Solved	My Status
1	Division of Nlogonia	1/2	Accepted
2	Cancer or Scorpio	0/2	Not submitted
3	The 3n + 1 problem	0/2	Not submitted
4	Request for Proposal	0/2	Not accepted

click to show/hide

Submitting the problem to MANABA (1)

After you finish the problems listed in the monitor, you need to submit your source code to MANABA.
Go to “Assignment/Reports” and select the appropriate week.
Create a zip file containing the code for all problems that you have solved, AND the discussion file and send it.

Attention

Submission to the UVA judge without a submission to MANABA will not be accepted!

Some warnings about Java:

- All code must be in the same source file (can define many classes in this file)
- All programs must begin in a static main method in a Main class.
- Do not use public classes. Even Main must be non public.
- Use Buffered I/O to avoid time limit exceeded.

Outline

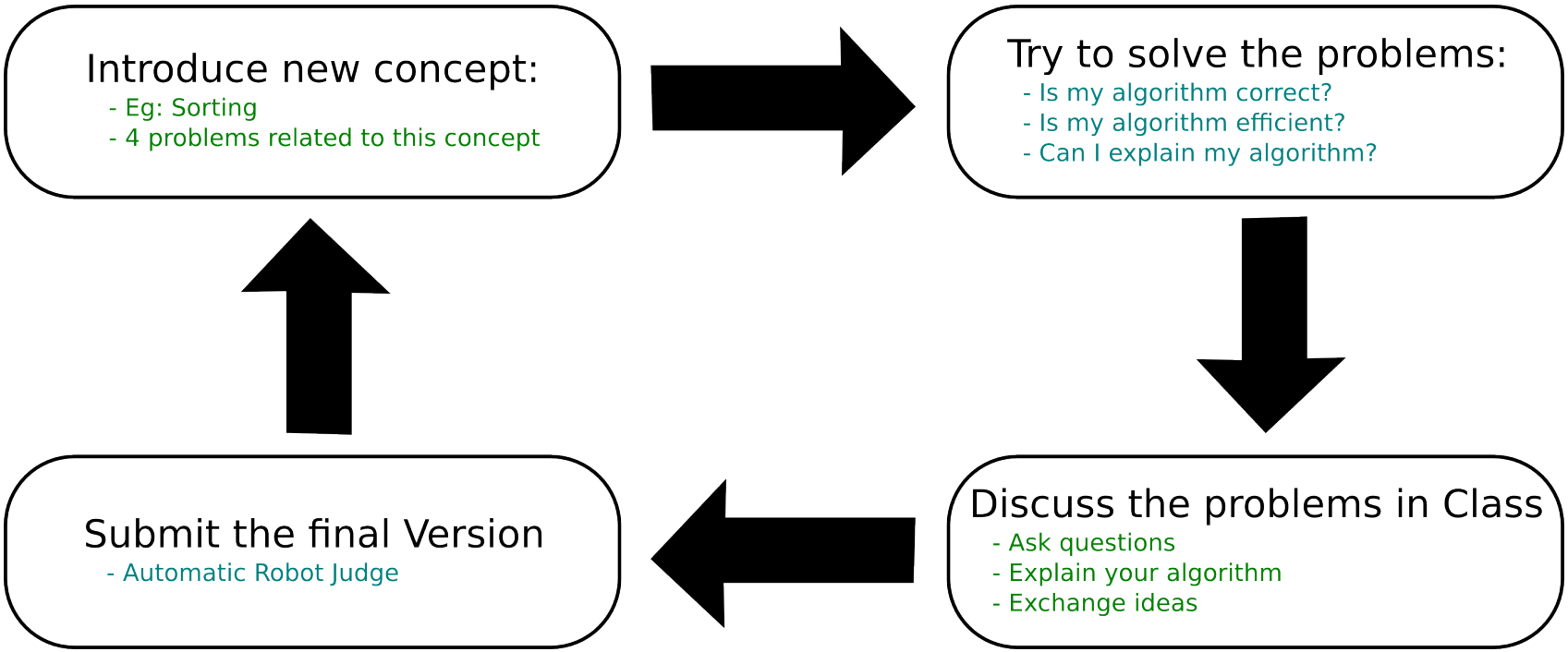
Two classes per week

- Each week has a theme
- Friday Class: Introduction
- Monday Class: Problem Solving and Q&A

Solving Problems

- Every week there are four programming assignments;
- Assignments follow the weekly theme;
- Automatic Submission and Evaluation System;
- Program Deadline is Thursday 23:59

Outline


Introduce new concept:
- Eg: Sorting
- 4 problems related to this concept
Try to solve the problems:
- Is my algorithm correct?
- Is my algorithm efficient?
- Can I explain my algorithm?
Discuss the problems in Class
- Ask questions
- Explain your algorithm
- Exchange ideas
Submit the final Version
- Automatic Robot Judge

Evaluation and Grading (1)

Evaluation Criteria: Problems solved, Code and Participation

Evaluation Process: Base Grade +Bonus -Penalty

Evaluation and Grading (2) – Base Grade

The Base Grade is decided solely based on homework submissions to UVA.

- C: One problem per week, or X_c problems total
- B: Two problems per week, or X_b problems total
- A: Three problems per week, or X_a problems total

Parameters $X_{a,b,c}$ will be decided at a later date.

Evaluation and Grading (3) – Bonus and Penalty

A Bonus or Penalty will be added to the base grade.

- Bonus: grade one step up (C->B, B->A, A->A+)
- Penalty: grade one step down (A+->A, B->C, C->C)

Bonus: Grade Up

- Participation in class and MANABA
- Submit corrections/suggestions to lecture notes
- Good comment files in homework
- Best *N* students in number of submissions

Penalty: Grade Down

- More than 25% late problems.

Parameter *N* will be decided at a later date.

Evaluation and Grading (4) – comment file

When you submit your program to Manaba, you need to include a text file with comments on each problem.

Good Comment

```
# Problem 1:
This problem needs to sort the input. I used quicksort.
I sorted the age of the persons in the input.
To make it faster, people with the same age were
removed from the data.
Must be careful about the large size of the input
```

Bad Comment

```
# Problem 1:
Quicksort.
```

Comments may be in Japanese. (FILENAMES must be in romaji)

Evaluation and Grading (5) – about plagiarism

The assignments are individual. Use your own strength to solve the programs.

GOOD

- Ask for ideas to your friends;
- Ask for ideas in the MANABA forum;
- Ask for help with a bug;

BAD

- Copy a solution from the internet;
- Copy a solution from your friends;
- Give your code to a friend;

Plagiarism will result in course failure, and possibly worse.

Class Links

- Manaba Page: All the class material will be here. Access Code is: 4004466
- UVA Online Judge: Use this page to submit your problems. Make an account and list the username on MANABA
- Problem Monitor: Use this page to check deadlines and weekly problems.
- Github Repository: Working directory for lecture notes. Send me PR, issues!

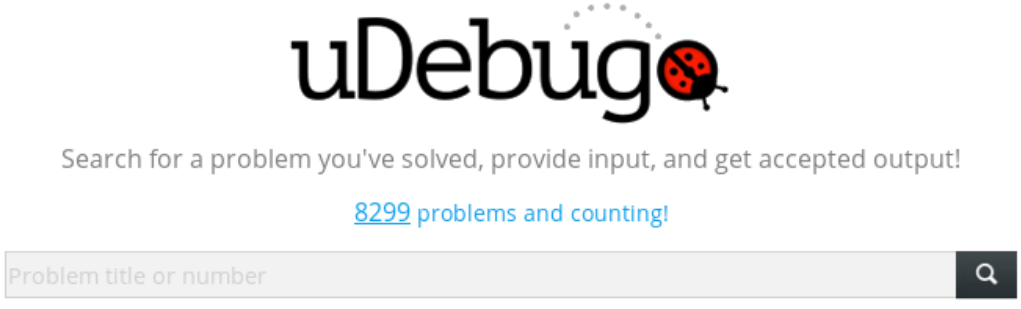
Books

- Main Book: Competitive Programming, 3rd Edition
  `http://cpbook.net/`
- Suggested Books: Programming Challenges
  `https://books.google.co.jp/books/about/Programming_Challenges.html?id=dNoLBwAAQBAJ&source=kp_cover&redir_esc=y`

uDebug Tool

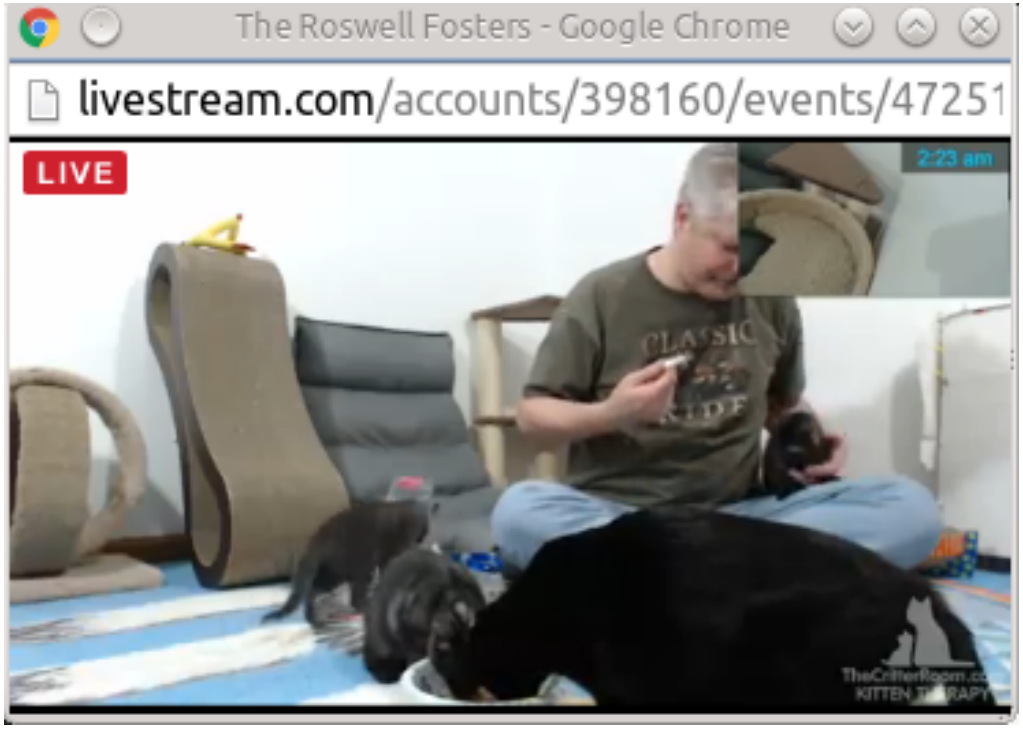
If you are having problems, the uDebug site offers, for many problems in UVA, the correct set of outputs for any input you give.

`https://www.udebug.com/`



If you are still having problems...

Watch a cat stream to relax!



`http://livestream.com/FosterKittenCam/`

Contact the professor

- e-mail: caranha@cs.tsukuba.ac.jp
- website: `http://conclave.cs.tsukuba.ac.jp`
- twitter: @caranha

- Room: SB1012
  Best times to find me: Monday, Thursday, Friday Morning (9:00 – 11:00)

Both English and Japanese are okay!

Do we still have some time?

- Create an account on UVA (if you already have an account, you can use that)
- Submit your account name to the MANABA
- Ask any other questions you want to know!

Thank you for today!