NAPROCK 5th International Programming Contest: Competition Section
Communi*Key*tion: *Lock 'n' Roll* the Dice!

Outline of Competition

Today, we can communicate information from anywhere as long as a communication environment is set up. The diffusion of the Internet and wireless network makes this possible. In an information and communication society, efficiency in base technology such as encoding, decoding and encryption, take a very important role to communicate information fast and accurately.

s NAPROCK programming contest, participants will compete on how accurately they communicate a given string by using dice as communication media. The key for successful communication relies on how to efficiently utilize functions such as encoding, decoding, encryption, detection and correction of errors. This year, all participating teams as well as audiences can view the information using dice transmitted by other teams. In other words, the transmitted information needs to be encrypted in a way that only own team members can decipher. Otherwise the contents of the encoded string can be utilized as reference data or the communication protocol might be analyzed by other teams. During the competition, the receiver side of the team cannot tell whether the answer is correct or not, while the sender side can. Thus if necessary, the sender is allowed to send a revised answer (the receiver cannot contact the sender) for corrections.

Above all, participants need to convert their assignments into a string (encrypted string) which is locked with an encryption code that is only recognizable among their own team members. The competitors then need to create an algorithm to communicate their answers fast and accurately by using their dice.

Terminology
Sender   side
- The   side,   to indicate everything on stage in the main hall including booths (tables, chairs and power strips, etc.), participants of the contest, PCs and other objects that participants bring with them.
- Participants can only bring their PCs (including their AC/DC adapters), LAN cable, and a network hub for connection with these devices on the stage in the main hall; all other items are prohibited.

Answering room
- An Answering room is located on the back side of the stage in the main hall. It is shielded so that the sound generated in the main hall is blocked (Background music will be provided as needed). Participants, whose roles are to answer, will wait in this room. Each team is assigned a table, chairs, a power strip and a LAN cable (TCP/IP) with RJ45 connector.

- Answering room provides the time of the match which is synchronized with the server.

Receiver　side

- The　　　　　　　　　　　　　　　　　　　　　the answering room and whatever is placed in the answering room. This includes tables, chairs, power strips and other things utilized. This also includes the participants who will receive and send answers.
- Participants can only bring their PCs (including their AC/DC adapters), LAN cable, and a network hub for connection with these devices in the answering room; all other items are prohibited.

Booth

- It is defined as an assigned space to each team which is formed with tables and other necessities on both sender s and receiver s sides.
- All activities for competition take place in a booth.

Communication

- It is defined as an act of sending an assignment string from the sender　side to the receiver　side. The receiver　side cannot communicate to the sender　side.

Assignment

- An assignment is a sting to be communicated for competition. The maximum size of a string is 4,000 characters.
- ASCI characters from 0x21 (33 in decimal) to 0x7A (122 in decimal) are used for characters, numbers and symbols of the assignment to be communicated in this competition (see Table 1. below). Note that no symbol corresponding to codes from 0x5B to 0x5E (91 to 94 in decimal) which can accept multiple assignments are used. For alphabets, please note that they are case sensitive.
- An assignment is stored in USB flash memory and distributed to each team at the start of the competition.
- The following are examples of assignments　　　　　　　　　　　　　　　　　　normal English sentences.

  Example 1：
  Example 2：

  Example 3：

Table 1. Characters, numbers and symbols used for the assignment

0x	20	30	40	50	60	70
0	■					
1						
2						
3						
4						
5						
6						
7						
8						
9						
A						
B				■		■
C				■		■
D				■		■
E				■		■
F						■

Dice

・ Dice are used as a medium for communication.

・ We will use the same dice used for the competition in NAPROCK 4th International Programming Contest.

・ The color of the dice is white. The faces of the dice come with a dot (dots): the face for number one comes with a red dot. The faces for number two through six come with black dots. The condition of the prints and the status of color, may vary depending on each die. Thus we cannot guarantee that each face of die comes with clear dot print(s).

・ Dice come in three different sizes: small (about a 6mm-cube), medium (about a10mm-cube) and large (about a 16mm-cube). The size and shape of each die varies. Thus all dice are not completely identical hexahedral.

・ Each team will be provided more than 180 dice in each size for each match.

・ Altering of the dice such as writing on or coloring is prohibited.

Packets

・ Packets are provided to install the dice used for communication. The base area of a packet is about the same size as an A6-sized paper (100 mm×150 mm).

・ The base surface comes with a sheet to hold the dice in place (silicone rubber sheet, double-sided tape, etc.).

・ Packets can only accept dice in the aforementioned three sizes, small, medium and large; Dice other than these sizes are not placed in the packet.

- Altering of the packet such as writing on or coloring is prohibited.
- Each team is provided with five packets per match.
- A web camera is set up above the packet and an image is captured in an interval of 10 to 60 seconds.
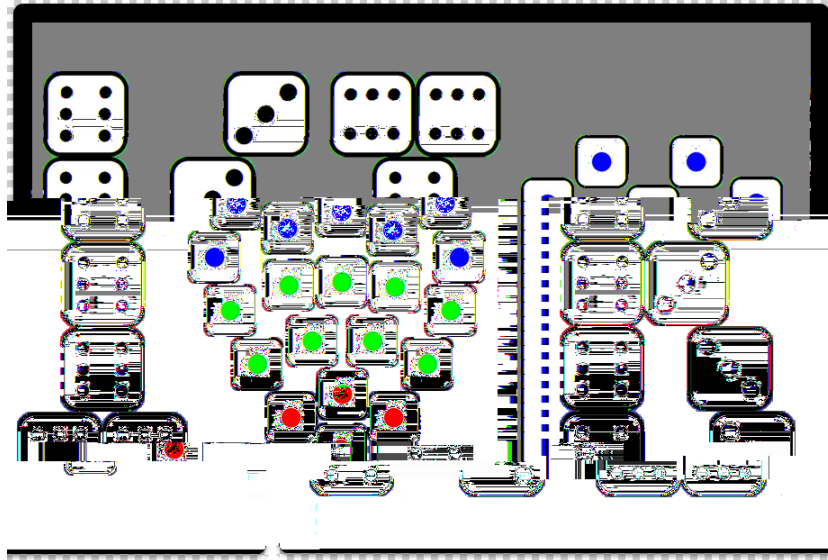- The packet which contains dice can be called simply as packet in the following.

Figure 1. A sample of packet

Encoding

- Encoding is defined as an action to encode characters, numbers and symbols of an assignment with dice.
- Encoding is performed in booths which are set up on the stage in the main hall.

Packet Setting

- It is defined as setting a packet in a designated area (a space for image capture) next to booths on the stage in the main hall, so that the status of packet is captured by a web camera.
- A web camera captures an image of the set packet in an interval of 10 to 60 seconds and automatically uploads the image to the server.

Packet Image

- Images of packets are captured by a web camera and uploaded to the server after being set in place.
- Packet images are numbered serially per team and are saved in the server by using their serial numbers for their file names.

Decoding

- Decoding is defined as an operation to convert the packet image uploaded to the server into characters, numbers and symbols.
- This task is performed in the booths in the answering room.

Submission of Answer

- It is defined as an act to submit a string (an answer) to the server in accordance with the answering rules in the answering room.
- When the answer contains a decoding error, the people in the main hall can view where the first error occurred on the screen on the stage. The error status is not available for those in the answering room.
- When any character, number or symbol which is not used in the assignment is included in the answer, it is considered to be an error.
- If a sting containing more than the maximum number of characters (4,000 characters) is submitted, it may be rejected by the server.

Time Limit

- A time limit is set for each answering session of a match.
- Currently the organizer is planning to set the time limit from 3 to 10 minutes. However, please refer to an official time limit, which is to be announced before each match starts.
- Participating teams must complete transmitting the answer within the time limit. Anything submitted after the time limit becomes invalid.

Procedures of the Match

- There is a maximum of 12 teams that compete in a match.
- As a general rule, an assignment is provided for each match.
- A match is conducted in the order of receiving a USB flash memory, loading the assignment, encoding, communicating (packet setting), decoding and then submitting an answer.
- Once a match begins, a USB flash memory is distributed to each team on the stage in the main hall.
- Each team loads an assignment from the USB flash memory, encodes the text in their own method, and sets dice in a packet to communicate their answers.
- A web camera synchronized with the server captures the images of the packet set with the dice in an interval of 10 to 60 seconds, and uploads the images on to the server.
- The receiver side then downloads the images of the packet which were uploaded to the server to their PC and decodes them.
  be downloaded.
-           side submits an answer obtained by the decoding. Once the server receives the answer, it notifies the acceptance to the sender.
- The screen set on the stage in the main hall, displays the number of correct characters once each team submits their answers. The receiver side cannot view the screen. Displaying the

status of the answers stops about 1 minute before the end of the match.

・ The sender　side can send a revised encoded string to correct the wrong characters, numbers and symbols.

・ In the end, the total score is tabulated and the teams are ranked according to the total score.

Method of Answering

・ Each team connects a LAN cable provided in the answering room to their own PC used for the receiver　side. Then, they transmit an answer either by inputting the answer in the html answer form, which is found in the answering system or using software provided by the organizer. Answers are created with the POST method of http.

・ The PC on the receiver　side is connected to the server with DHCP format.

・ 　　　　　side needs a token of identification to send an answer. Tokens are distributed in advance before the match.

・ The maximum count to transmit an answer is limited to a 100 times for each match.

・ The source codes of the software for the answer transmission will be disclosed. The participants are allowed to create their own software for their answer transmission for the contest.

Method of Team Ranking

A winner is determined based on the following factors:

1. The number of correct characters from the beginning of the assignment to the end (the more correct characters that are counted from the beginning of the text to the end in the series, the higher the rank of a team)

2. In the case that teams tie, based on the above factor, the total time taken to submit the answer is taken into account (The team that submitted their answer in a shorter amount of time is ranked higher.)

3. In case these teams tie based on the above factors, the sum of dots on the dice will determine the higher ranked after they roll.

Other Rules and Notes

・ Participants are allowed to bring in and use a maximum of 3 units of portable and programmable computer devices for competition. Among these three, at least one unit shall be assigned for an answering purpose. This shall come with LAN cable port (RJ45) for 100BASE-TX and compatible with the TCP/IP method.

・ Participants are prohibited to take a picture or video during the competition.

・ It is on the　　　　　　　discretion to determine how to assign the above mentioned computer

devices on the stage in the main hall or in the answering room.

- Currently the organizer is planning to provide two power plugs, approximately for 150W in total, per table on the stage in the main hall and in the answering room.

- Participants can only communicate images of dice between the stage in the main hall and the answering room among their own team members. No other information is allowed to be communicated. Participants are prohibited to communicate with non-participants by other methods of communication such as language, etc.

- The sender side can check correctness of the answers sent by the receiver side through the screen on the stage in the main hall. The sender can transmit the revised data regarding the wrong characters, numbers and symbols again to the receiver side. Meanwhile, the receiver side cannot check the correctness of the submitted answers, nor communicate to the sender s side.

- Wireless communication between all devices brought in (including personal computer) shall be prohibited.

- Any act of interference of the server or the competitors shall be prohibited.

- An act of transmitting an excessively long answer which surpasses the maximum number of characters (4,000 characters) may be considered as a malicious act of interference for the competition.

- If the organizer judges a team which interrupted the progress of a competition, judgment or other activities of other teams, or if they performed other prohibited acts in the competition, the team will be disqualified to compete. A disqualified team shall receive the lowest rank in the tournament.

- In case any trouble is experienced on the system provided by the organizer, participants may be required to submit the answers off-line instead of transmitting them through the network. In this case, the time limit of the match and the number of answer submission may be changed.

- Do not write any character or symbol on the device or tools provided by the organizer.

- In case any trouble is experienced on the organizer side, teams may compete again with another assignment.

- During the competition, participants and desks of the participants (such as computer screens, status of operation, etc.) may be filmed, recorded and projected on the screen simultaneously by a video camera or other device.

- The status of the answering room may be broadcasted on the screen on the stage in the main hall.

- During the competition, members of the judgment committee may come to view the participants and their desks of the participating teams (such as their computer screens, status of operation, etc.) for judgment purposes.

- The data used for competition and transmitted to the server by each team, may be released to the public after the competition, such as on our website.

Software Provided for Competition

- ・ The organizer is planning to provide protocol for answer submission, and the simplified software for answer submission and its source code by the end of May.
- ・ The organizer is planning to release sample images, sample assignments and details of web cameras at the same time.
- ・ The above mentioned software and other information will be provided on the official website.

Contact

Please send your inquiry to the following address by e-mail. Note that your inquiries as well as the answer are to be released on our website (Any inquiry which might affect the result of the contest is also released on our website).

Email: naprock-procon@tokyo-ct.net