1 Problem Descriptions

Short descriptions of 15 problems[1] used in the evaluation of the presented approach (problems with minor variations in formulations are listed as (a) and (b)):

1. (a) Write a program that checks whether the digits of a given four-digit number are in ascending order.

   (b) Write a program that computes the product of all even digits of a four-digit number.

2. (a) Write a function that computes the maximal value of a given array. Write a function that computes the mean value of a given array. Write a program that uses these two functions and that determines whether the maximal value is at least two times bigger than the mean value.

   (b) Write a function that computes an index of a minimal element of a given array. Write a function that computes an index of a maximal element of a given array. Write a program that uses these two functions and that computes whether the index of the maximal element is bigger than the index of the minimal element of a given array.

3. (a) Write a function that converts all lowercase letters that are on even positions in a given string into corresponding uppercase letters, and all uppercase letters that are on odd positions in the given string into corresponding lowercase letters. Write a program that uses this function. Input strings are not longer than 20 characters.

   (b) Write a function that converts all lowercase letters in a given string that are on positions that are divisible by three into corresponding uppercase letters, and all uppercase letters that are on positions which when divided by three give reminder one into corresponding lowercase letters. Write a program that uses this function. Input strings are not longer than 20 characters.

4. Write a function that calculates an array of maximal elements of rows of a given matrix. Write a program that uses this function.

5. (a) Write a function that deletes a character on a position k in a given string. Write a program that uses this function. Input strings are not longer than 20 characters.

   (b) Write a function that duplicates a character on a position k in a given string. Write a program that uses this function. Input strings are not longer than 20 characters.

6. (a) Write a function that calculates the sum of all elements that are above the secondary diagonal of a given matrix. Write a program that uses this function.

[1] Problems are taken from the paper *Software Verification and Graph Similarity for Automated Evaluation of Students' Programs*, Information and Software Technology, Elsevier, 2013, `http://dx.doi.org/10.1016/j.infsof.2012.12.005`

(b) Write a function that calculates the sum of all elements that are below the secondary diagonal of a given matrix. Write a program that uses this function.

7. Write a program that calculates the maximum of two given real numbers.

8. Write a function int `strcspn(char* s, char* t)` that calculates a position of the first occurrence of a character from the string t in the string s. Write a program that uses this function. Input strings are not longer than 20 characters.

9. Define a data structure for fraction. Write a function for comparing two given fractions. Write a function that computes the minimal fraction in a given array. Write a program that uses these functions.

10. Write a program that prints a bow of a size n. For example, for $n = 5$ the output should be

```
xxxxx
.xxx.
..x..
.xxx.
xxxxx
```

11. Write a program that calculates the determinant of a given 2×2 matrix.

12. Write a program that calculates the maximal value of three given numbers.

13. Write a program that prints values of the cosine function in ten equidistant points from a given interval $[a, b]$.

14. Write a program that for a given time calculates the number of seconds until the next noon.

15. Write a program that for a number n prints the numbers from 1 to $n - 1$, then from 2 to $n - 2$, from 3 to $n - 3$ and so on.