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Abstract

This application is based on Casio MS-8L calculator. It includes 24 keys (AC not working) and one line display for integer or decimal value calculation. There are number keys, point key, operator keys, memory keys and clear key. Besides, the application is developed under Android SDK API 15(Android 4.0.3) and JDK 1.7.0.

Control Flow Graph

As shown in the graph below, the first one illustrates overall logic and the second one explains 'NumberFun' and 'PointFun' part in overall logic graph. Firstly the application checks the key's type to continue different action. Then it checks the formula type to process different logic. Take "1+2" for example, 'Num' means "1", 'NumOp' means "1+", 'NumOpNum' means "1+2". The application has some variables to process logic and record the calculation formula. Num1, Num2 and Op are to record variables and operation in the formula so that it can be used to check formula type. 'IsResult' is to record the whether calculation finished or not so that it can be used to check whether to restart input after clicking keys. Besides, memory is to record independent memory value which is used in MRC M+ and M- function.
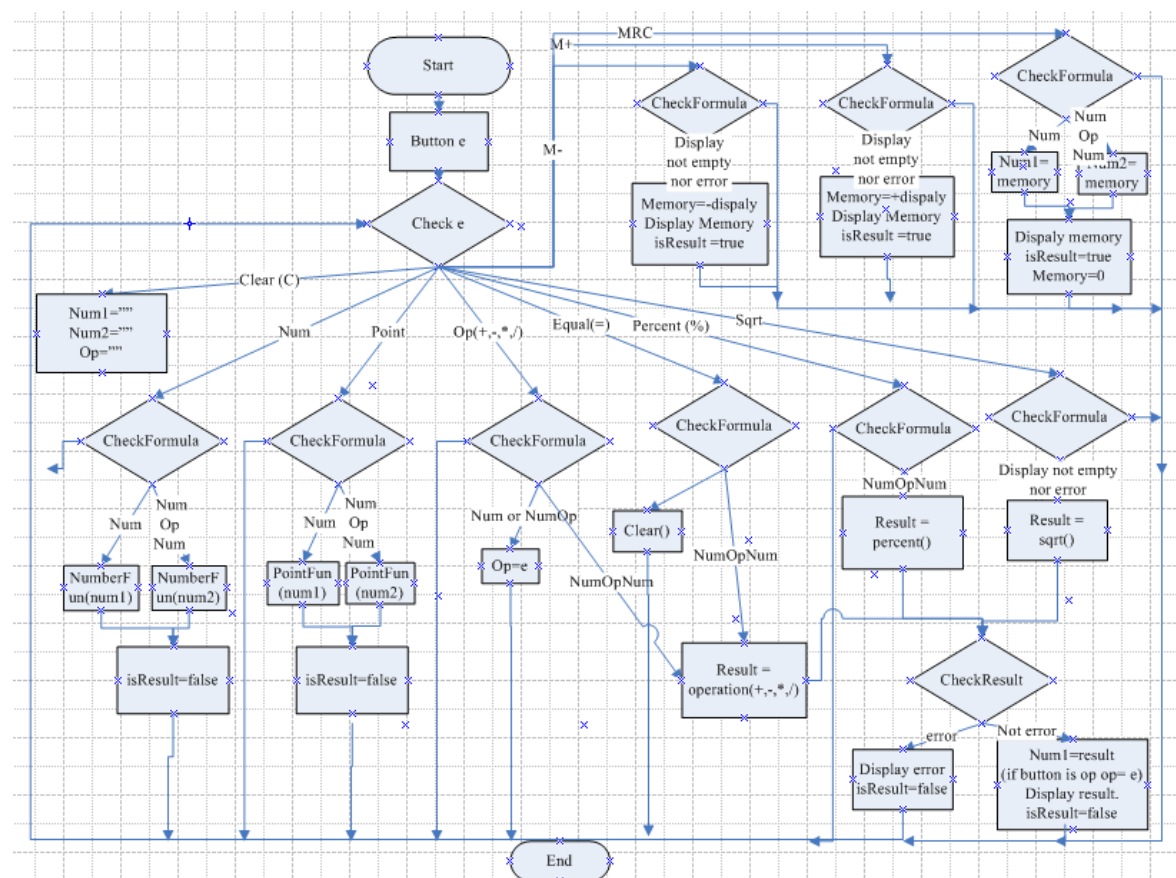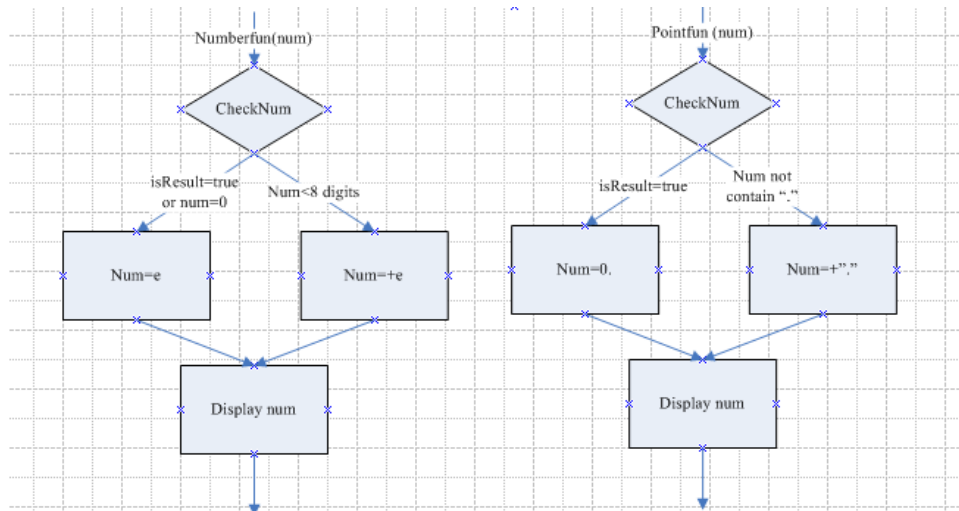
Implemented Function

■ 8-Digits Display:

The display can show 8-Digits Integer or Decimal value. The '8-Digits" does not refer to the digit of point, negative sign or scientific notation.

For input, if the displayed number is 8-Digits, the number key will not work for adding number.

For output, if the number is less than 8-Digits, it will be displayed. Otherwise it will be converted into scientific notation and keep the part before notation less than 8-Digits by rounding method.

■ Correct input error

1 If the wrong operation key (⊞, ⊟, ⊠, ⊟) is pressed, simply press correct key to continue.

2 To clear the calculation except for the independent memory, press clear key ⊞.

3 If the "error" appears on the display, press ⊞ or number key to restart calculation.

■ Normal Calculations

1 The normal calculation includes addition, subtraction, multiplication and division.

2 For division, if divisor is zero, the display shows "error".

■ Square Root Calculations

If square root is less than zero, the display shows "error".

√ 4	4 ⬜	2
√ -1	-1 ⬜	error

■ Percent Calculations: ⊞⊟⊞⊠⊠⊟ √ % ×

If operator is division and number before percent is zero, the display shows "error".

5 %	5 🔲	0.05
100 + 5 %	100 ⊞ 5 🔲	105
100 - 5 %	100 ⊟ 5 🔲	95
100 ✕ 5 %	100 ⊠ 5 🔲	5
100 ÷ 5 %	100 ⊞ 5 🔲	2000
100 ÷ 0 %	100 ⊞ 0 🔲	error

■ Independent Memory

1 M+: adds the displayed value to independent memory

2 M-: subtracts the displayed value from independent memory

3 MRC: Recalls and clears independent memory

8 ✕ 9 = 72 M+ 5 + 6 = 11 M+ 1 M+ +2 M+ MRC	8 ⊠ 9 ▤ M+ 5 ⊞ 6 ▤ M+ 1 M+ ⊞ 1 M+ MRC	86(72+11+1+2)

Future Function

M : Independent memory indicator
E : Error indicator
– : Negative value indicator
K : Constant calculation indicator

As Casio MS-8L calculator display shown above, it should include additional indicators. Specifically, 3-digit separator between numbers is to make number's digit clear, and four signs on the display left border are indicators. For this project, 3-digit separator, independent memory indicator and constant calculation indicator are ignored. Error indicator is implemented by displaying "error". Negative value indicator is implemented by displaying negative sign before number

Apart from the display problem, there are mistakes for operator key and memory key according to the principle of calculation. Take the result of 1+= for example, this application will return 1, but some Casio calculators will return 2 or error. Another example is the result of 1+2 M+. This application will keep the calculation status of "1+2" and 2 is added into memory, but some Casio calculator will finish the calculation of "1+2", the result of 3 is displayed and added into memory. There are still hidden problems to be solved in the future.