

Pseudocode

Coding Discussions 24/11-2021

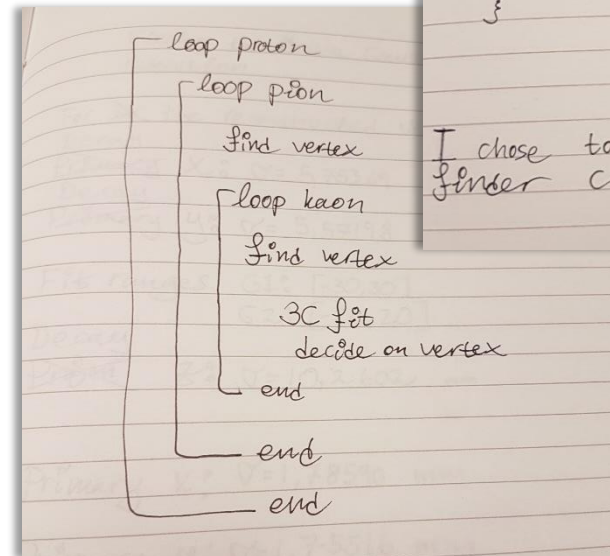
Jenny Regina

What is pseudocode really?

- Representation of an algorithm
- Written in plain (English)
- No (or almost no) syntax – it can not be compiled or interpreted
- Commonly used in textbooks or articles describing various algorithms

Why use pseudocode?

- Improves the readability and understanding of an approach
- Good for starting implementing an algorithm (create the blueprint before you start building!)
- Works as a rough documentation
- Is not generally dependent on coding language so it can be used for porting a code to a different
- Top-down approach for solving a problem



Structure for finding vertices

pass all combinations of particles to the vertex finder. Then, the user needs to pick which vertex they want and pass the output to a function that calculates the lambda candidate

Analysis

```
for (proton cand) {
  for (pion cand) {
    for (kaon cand) {
      pick all pairs of two particles of
      different species; + calculate (find
      the vertex);
    }
  }
  pass difference to lambda
  finder class;
}

Find lambda candidate;
```

I chose to pass the vertices to the lambda finder class instead of the difference.

Pseudocode in Theses

(b)

Figure 7.3. (a) Upper-right track from Figure 7.2. The possible isochrone positions are centered in the skewed straws and tangential to the track. (b) The resulting (S, z) hits of the all detector hits from the track in (a). The squares and triangles represent MVD pixel- and strip hits, respectively. The crosses are possible (S, z) hits from the skewed STT hits. The green points show the MC truth position of the skewed STT hits.

The isochrone alignment procedure is summarized in Algorithm 1.

Algorithm 1: Isochrone alignment.

Data: PANDA track, N_{STT} skewed STT hits
Result: (S, z) hits

for skewed STT hit $i \leftarrow 1$ to N_{STT} **do**
 Extract xy -projections of skewed tube and isochrone;
 Find $2N_{\text{STT}}$ isochrones positions that are:
 i Centered along tube
 ii Tangential to track circle
 Calculate (S, z) of isochrone center;
end
Return $2N_{\text{STT}}$ (S, z) hits;

W. Ikegami Andersson, Uppsala University 2020

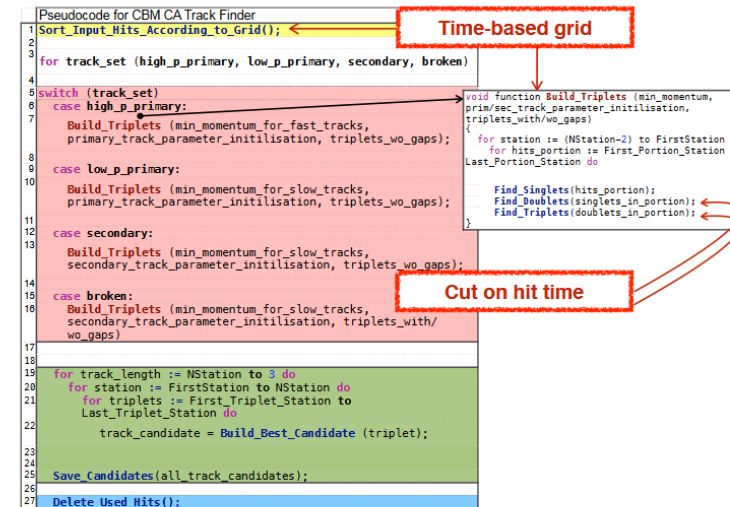


Figure 7.3: The pseudocode scheme for the parallel time-based CA track finder algorithm. In the time-based version the grid structure was modified to take into account time information. Also, the STS time measurement is used to reduce combinatorics in the triplet building stage.

only in space, but also in time. Neglecting the time of flight between stations, the hits belonging to the same track should coincide in time measurement within the detector time precision.

V. Akishina, Goethe-Universität, Frankfurt, 2017

How to write pseudocode?

- No syntax rules
- Variable declarations are usually omitted from the code
- Function calls and blocks of code, *e.g.* contained in a loop are often replace by a natural sentence
- Should include every instruction for the program (think that you are instructing a robot)

Words to use in Pseudocode

- Do While...EndDo; Do Until...Enddo; Case...EndCase; If...Endif; Call ... with (parameters); Call; Return; Return; When;
- Generate, Compute, Process
- set, reset, increment, compute, calculate, add, sum, multiply, ... print, display, input, output, edit, test

Examples of Pseudocode

If student's grade is greater than or equal to 60

 Print "passed"

else

 Print "failed"

IF HoursWorked > NormalMax THEN

 Display overtime message

ELSE

 Display regular time message

ENDIF

From Code to Pseudocode, C++ example

```
int main()
{
    int num;
    cout<<"Enter a number";
    cin>>num;

    if(num%2==0)
        cout<<"Even Number";
    else
        cout<<"Odd Number";
}
```


From Code to Pseudocode, C++ example

```
int main()
{
    int num;
    cout<<"Enter a number";
    cin>>num;

    if(num%2==0)
        cout<<"Even Number";
    else
        cout<<"Odd Number";
}
```

```
num :INPUT "Enter a number"
IF num MOD 2 ===0
    print "Even Number"
ELSE
    print "Odd Number"
```

Example of Good Pseudocode

"Adequate"

```
FOR X = 1 to 10
  FOR Y = 1 to 10
    IF gameBoard[X][Y] = 0
      Do nothing
    ELSE
      CALL theCall(X, Y) (recursive method)
      increment counter
    END IF
  END FOR
END FOR
```

Example of Good Pseudocode

"Adequate"

```
FOR X = 1 to 10
  FOR Y = 1 to 10
    IF gameBoard[X][Y] = 0
      Do nothing
    ELSE
      CALL theCall(X, Y) (recursive method)
      increment counter
    END IF
  END FOR
END FOR
```

"Better"

```
Set moveCount to 1
FOR each row on the board
  FOR each column on the board
    IF gameBoard position (row, column) is occupied THEN
      CALL findAdjacentTiles with row, column
      INCREMENT moveCount
    END IF
  END FOR
END FOR
```

Example from PandaRoot

Example from PandaRoot

Algorithm 2: 4D Cellular Automaton

Data: STT Hits, threshold time

Result: Clustered STT Hits

for *Every STT Hit* **do**

if *STT Hit is neighboring another STT Hit* **then**

if *Timestamps of both STT Hits < threshold time* **then**

 Accept hits as neighbors;

else

 Reject hits as neighbors;

end

end

end

return *Clustered Hits*

Questions

- Have you ever written a pseudocode for a project or part of a project?
- Do you have a project or part of a project that you would like to document with a pseudocode for a thesis or a publication?
- Do you have a project or part of a project that you would like to implement and where the work process could benefit from writing a pseudocode?
- If not, try to think about a project or part of a project where you could write a pseudocode, *e.g.* an analysis procedure

Writing pseudocode in LaTeX

(Example that worked for me with the Uppsala University PhD Thesis Template)

```
\begin{algorithm}
\KwData{STT Hits, threshold time}
\KwResult{Clustered STT Hits}

\For{Every STT Hit}{

\If{STT Hit is neighboring another STT Hit}{

\elf{Timestamps of both STT Hits  $\leq$  threshold time}{

Accept hits as neighbors;

}{Reject hits as neighbors;}

}

}

\Return{Clustered Hits}

\caption{4D Cellular Automaton}

\label{algo:4DCA}
\end{algorithm}
```

```
\usepackage[ruled]{algorithm2e}
\usepackage{algorithmic}
```

Algorithm 2: 4D Cellular Automaton

Data: STT Hits, threshold time

Result: Clustered STT Hits

for *Every STT Hit* **do**

if *STT Hit is neighboring another STT Hit* **then**

if *Timestamps of both STT Hits $<$ threshold time* **then**

 Accept hits as neighbors;

else

 Reject hits as neighbors;

end

end

end

return *Clustered Hits*

References

<https://www.geeksforgeeks.org/how-to-write-a-pseudo-code/>

<https://en.wikipedia.org/wiki/Pseudocode>

<https://www.unf.edu/~broggio/cop2221/2221pseu.htm>

https://users.csc.calpoly.edu/~jdalbey/SWE/pdl_std.html

<https://www.techgeekbuzz.com/how-to-write-pseudocode/>

<https://wtmatter.com/pseudocode/>

<https://slideplayer.com/slide/12825582/>

If (time == 14:00)

thank you!

Elseif (!material)

thank you!