Introduction to Array Programming

Rob Moore

Notation as a tool of thought

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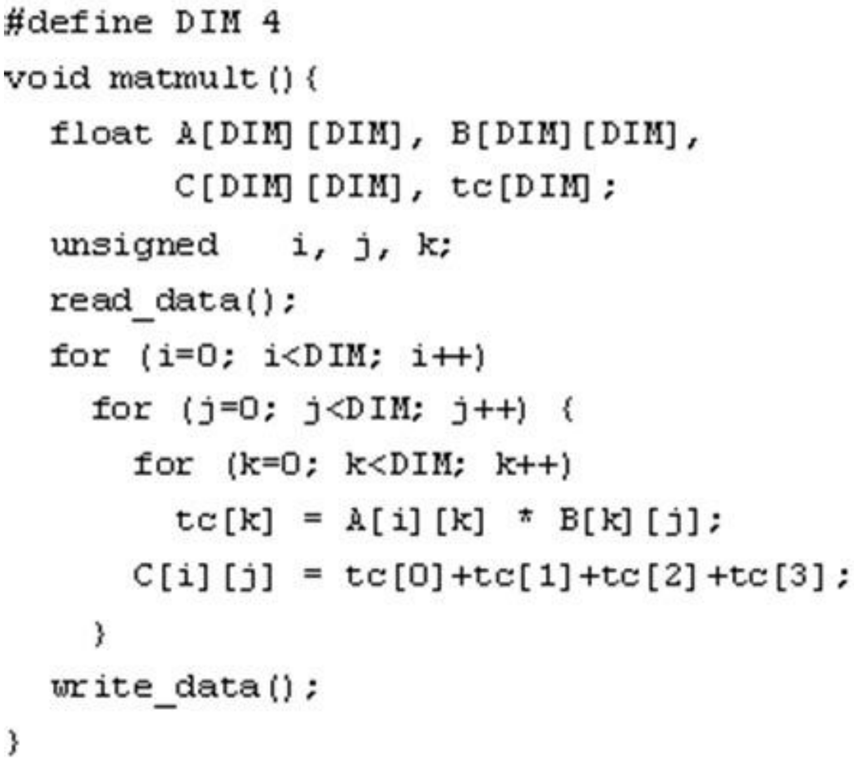

```
#define DIM 4
void matmult(){
  float A[DIM][DIM], B[DIM][DIM],
        C[DIM][DIM], tc[DIM];
  unsigned   i, j, k;
  read_data();
  for (i=0; i<DIM; i++)
    for (j=0; j<DIM; j++) {
      for (k=0; k<DIM; k++)
        tc[k] = A[i][k] * B[k][j];
      C[i][j] = tc[0]+tc[1]+tc[2]+tc[3];
    }
  write_data();
}
```

$$c_{ij} = \sum_{k=1}^{m} a_{ik} b_{kj}$$

```
c =: a (+/ . *) b
```

Nouns and Verbs

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    - 1 input: Monadic
    - 2 inputs: Dyadic

Scalars and Vectors

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Verb rank

Traffic data demo

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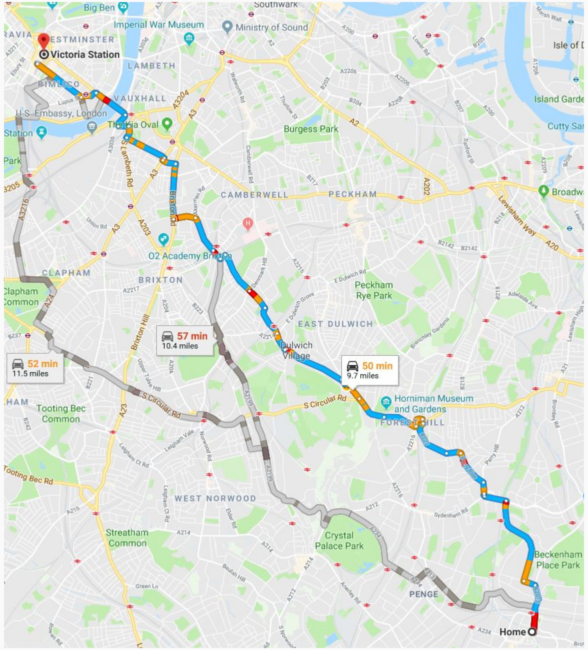
Based on the available traffic data, how can I minimise the number of bicycles my shuttle bus service encounters daily?

Traffic data demo

Data we have:

- Average annual daily flow of bicycles along all major roads in London.
- The major roads along the routes.



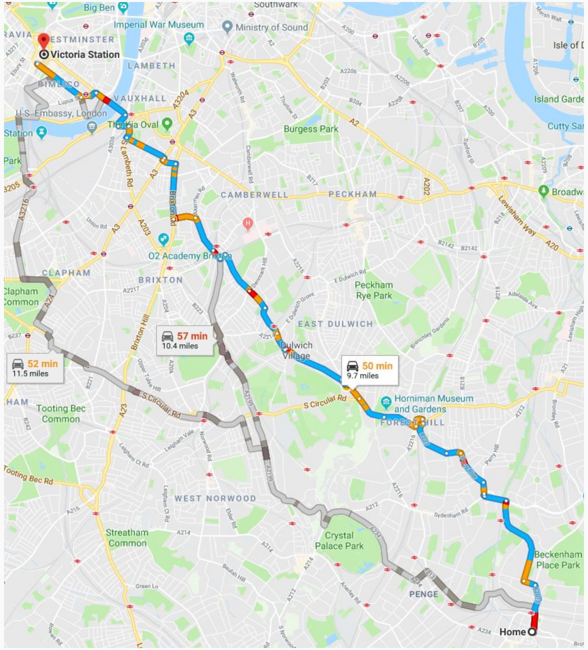
Traffic data demo

Data we have:

- Average annual daily flow of bicycles along all major roads in London.
- The major roads along the routes.

Question we want answered:

- Along which route will my shuttle bus service encounter the fewest bicycles?



Traffic data demo

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+/ (({. aadf) i. roads) { ({: aadf)
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roads ??? aadf
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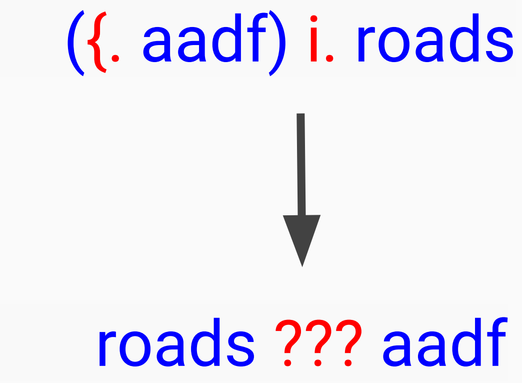

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⇔ roads i.~ ({. aadf)
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roads {:@] aadf ⇔ {: aadf
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+/ (({. aadf) i. roads) { ({: aadf)
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+/ roads ((i.~ {.) { {:@]) aadf
roads +/@:((i.~ {.) { {:@]) aadf
```

Thanks!

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