

## (a) Map index

Scene data and landmarks form structured records.

### Map sources

Named map entities  
Landmark directory

### Node association

Public graph anchors  
Same-floor association

### Indexed record $k \in K$

Names / aliases  $N_k$   
Descriptions  $T_k$   
Node ID  $v_k$ , floor  $\ell_k$   
Position  $\mathbf{x}(v_k)$   
Source / association

### Retrieval representation

Spatial filtering  
Character bigram similarity

### Coordinate authority

Graph node lookup  
returns stored coordinates.

## (b) Retrieval and evidence matching

Image  $I$  and optional user clues enter a bounded map context.

### Visual observation

Names, text, objects  
Floor label; score  $\gamma$

$O$

### Candidate retrieval

Spatial / floor  
filtering  
Lexical Top-20

$C_{20}$

### Evidence matching

Observation and  
retrieved  
map records

index  $K$  + position / floor context

Floor consistency and radius bound the search.

Candidate IDs and  
observation  $\leftrightarrow$  map evidence

## (c) Validation, ranking and coordinate resolution

### Validate evidence

Observed text spans  
Mapped text spans

### Rank candidates

Lexical, evidence,  
spatial and  
route scores

### Decision gate

Ready / confirm  
No match

$$S_k = \min\{\gamma, \kappa_k, 0.70L_k + 0.15M_k + 0.10D_k + 0.05R_k\}$$

ready /  
confirmed

### Apply selected anchor

Candidate  $\rightarrow$  node  $v_k \rightarrow (\text{lon}, \text{lat}, \ell_k)$

Validate map references and journey context; update the origin for route replanning.