**Sets**

* Nodes: Depot ;
* Hospitals ;
* All nodes .
* Vehicles: .

**Parameters (unitless, consistent with code)**

* : distance from node to for .
* : speed of vehicle .
* Travel time .
* Hospital demands: weight ,
* Hospital demands: volume .
* Vehicle capacities: weight ,
* Vehicle capacities: volume .
* Max tour distance: .
* Fixed cost ;
* Time-cost coefficient ;
* Distance-cost coefficient .
* Time windows at hospital .
* Priority weight .
* Penalty coefficients (early), (late);
* Time-scale factor .
* Start time at depot (e.g.).
* A sufficiently large constant .

**Decision variables**

* : vehicle travels directly .
* : hospital is served by vehicle .
* : vehicle is used.
* : arrival time at hospital .
* : earliness and lateness at hospital .

No load-flow variables are needed here, because we’re using **plain distance** cost (not load×distance).

**Objective (same 4 parts as in code)**

**Constraints**

**1) Each hospital is visited exactly once**

**2) Assignment–flow linking (per vehicle)**

**3) Depot degree equals vehicle usage**

**4) Weight & volume capacities**

**5) Per-vehicle max distance**

**6) Time propagation (Big-M)**

Let be a constant. For all , for all , , :

* If :
* If :

**7) Soft time windows**

**8) Subtour elimination**

Time propagation helps, but to be safe include MTZ (one common choice):

**9) Domains and arc exclusions**