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/* =====
 *
 * CS 566 - Assignment 04
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 *
 * ===== */

#define CELL(m,r,c) (((m)->data)[((m)->n)*(r) + (c)])

#define MIN_WORK_LEVELS 5
#define WORK_SLICE 10000000

struct prefix_list_node {
    struct prefix_list_node *next;
    int prefix_len;
    int prefix[];
};

struct termination_state {
    MPI_Request request; /* Make sure we don't modify the token while it's still being transmitted */
    /*
    int token; /* whether I have the token, and what color it is */
    int mycolor; /* what color I am */
    */
};

struct tsp_state {
    int num_procs;
    int myrank;
    int cost; /* the cost of this tour */
    int ub; /* the shortest path found so far (globally) */
    int ub_rank;
    int give_depth; /* the minimum depth from which we can give away work */
    int subtree_depth;
    int *last_started; /* an array of the last started node values at a certain depth */
    int len; /* length of the tour so far */
    struct tsp_matrix *matrix; /* the adjacency matrix of our TSP graph */
    struct termination_state term_token;
    int work_state;
    int work_partner;
    int *best_tour;
    int *send_buf;
    MPI_Request work_req;
    double work_time;
    double total_time;
    int tour[]; /* an array of node numbers, in the order which they are visited */
    /* tour must be the last field, since it's variable size! */
};

#define NO_TOKEN 0
#define WHITE 1
#define BLACK 2

#define NEED_WORK 0
#define WORKING 1
#define IDLE 2
#define QUIT 3
#define WORK_REQ_PENDING 4

struct tsp_state *tsp_state_alloc(struct tsp_matrix *matrix);

#define UB_TAG 1
#define WORK_REQ_TAG 2
#define WORK_ACK_TAG 3
#define TOKEN_TAG 4
#define TERMINATION_TAG 5
#define BEST_PATH_TAG 6
#define BEST_PATH_REQ_TAG 7

```

```
void tsp(struct tsp_state *state);
void do_work(struct tsp_state *state);
void service_work_request(struct tsp_state *state, MPI_Status status);
void service_pending_messages(struct tsp_state *state);
void request_work(struct tsp_state *state);
void send_ub_message(struct tsp_state *state);
void send_token(struct tsp_state *state);
```