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```

#ifndef PDE_TOOLS_H
#define PDE_TOOLS_H

#include "pnl/pnl_vector.h"
#include "pnl/pnl_matrix.h"

/**
 * \ defgroup PremiaPDEBoundary  to translate domaine from X0,X1 to [0,1]
 */
/*@{*/
typedef struct
{
    double X0; /*!< left point */
    double H; /* !< Step */
} PremiaPDEBoundary;

extern PremiaPDEBoundary premia_pde_boundary_create(double X0, double X1);
extern double premia_pde_boundary_real_variable(const PremiaPDEBoundary BP , dou
extern double premia_pde_boundary_Unit_interval(const PremiaPDEBoundary BP , dou
/*@}*/

/**
 * \ defgroup PremiaPDEDimBoundary Vector On boundary
 */
/*@{*/
typedef struct PremiaPDEDimBoundary
{
    PremiaPDEBoundary *array;
    /*!< pointer to store the data */
} PremiaPDEDimBoundary;

extern PremiaPDEDimBoundary *premia_pde_dim_boundary_create_from_int(int dim);

extern PremiaPDEDimBoundary *
premia_pde_dim_boundary_create(const PnlVect *X0,
                               const PnlVect *X1);
extern void premia_pde_dim_boundary_free(PremiaPDEDimBoundary **v);

```

```
extern double
premia_pde_dim_boundary_eval_from_unit(double(*f)(const PnlVect *),
                                       const PremiaPDEDimBoundary *BP,
                                       const PnlVect *X);

extern void
premia_pde_dim_boundary_from_unit_to_real_variable(const PremiaPDEDimBoundary *B,
                                                    PnlVect *X);

extern double
premia_pde_dim_boundary_get_step(const PremiaPDEDimBoundary *BP,
                                  int i);

/* @} */

typedef struct
{
    double current_step;
    int current_index;
    PnlVect *time;
    int is_tuned;
} PremiaPDETimeGrid;

extern PremiaPDETimeGrid *premia_pde_time_homogen_grid(const double T,
                                                         const int N_T);
extern void premia_pde_time_grid_free(PremiaPDETimeGrid **TG);
extern void premia_pde_time_start(PremiaPDETimeGrid *TG);
extern int premia_pde_time_grid_increase(PremiaPDETimeGrid *TG);
extern double premia_pde_time_grid_step(const PremiaPDETimeGrid *TG);
extern double premia_pde_time_grid_time(const PremiaPDETimeGrid *TG);

#endif
```