ThermalModel

5.0

Generated by Doxygen 1.8.14

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- Interactions

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Modules

- ThermalRider

6.2.1 Detailed Description

6.3 ThermalRider

Files

- file class_declarations.hh

  Forward declaration of classes defined in Thermal_rider model.
- file thermal_facet_rider.hh

  Defining the thermal characteristics of surface facets.
- file thermal_integrable_object.hh

  Define an IntegrableObject class adapted to thermal integration.
- file thermal_messages.hh

  Define the class ThermalMessages, the class that specifies the message IDs used in the model.
- file thermal_model_rider.hh

  Defining the thermal functionality.
- file thermal_params.hh

  A virtual base class for thermal facet parameters, used to add to the parameter lists for specific-model facets in their respective InteractionSurfaceFactorys.
- file thermal_facet_rider.cc

  ThermalFacetRider interaction model.
- file thermal_integrable_object.cc

  Encapsulates an integrator for a single facet.
- file thermal_messages.cc

  Implement the class ThermalMessages.
- file thermal_model_rider.cc

  ThermalModelRider interaction model.
- file thermal_params.cc

  Thermal Parameter definition.

Namespaces

- jeod

  Namespace jeod.

Macros

- #define PATH "utils/thermal_rider/"

6.3.1 Detailed Description

6.3.2 Macro Definition Documentation

6.3.2.1 PATH

```
#define PATH "utils/thermal_rider/"
```

Definition at line 37 of file thermal_messages.cc.

Chapter 7

Namespace Documentation

7.1 jeod Namespace Reference

Namespace jeod.

Data Structures

- class ThermalFacetRider

  Defining the thermal characteristics of surface facets.
- class ThermalIntegrableObject

  Encapsulates a thermal integrator for a facet.
- class ThermalMessages

  Specifying the message IDs used in the model.
- class ThermalModelRider

  Defining the thermal functionality.
- class ThermalParams

  A virtual base class for thermal facet parameters, used to add to the parameter lists for specific-model facets in their respective InteractionSurfaceFactorys.

7.1.1 Detailed Description

Namespace jeod.

Chapter 8

Data Structure Documentation

8.1 jeod::ThermalFacetRider Class Reference

Defining the thermal characteristics of surface facets.

`#include <thermal_facet_rider.hh>`

Public Member Functions

- ThermalFacetRider ()
  Constructor.
- virtual ~ThermalFacetRider ()
  Destructor.
- void initialize (double temperature, double surface_area)
  Initialize the thermal aspects of the facet.
- void accumulate_thermal_sources (void)
  Collects together all surface and internal thermal sources that affect a facet.
- double integrate (void)
  Runge-Kutta 4th order integration of the temperature variation.

Data Fields

- double d_temperature
  Change in temperature.
- double power_absorb
  Rate at which energy is absorbed from the environment, vehicle, and surface.
- double power_emit
  Rate at which energy is thermally radiated from the facet.
- double heat_capacity
  Heat capacity of the facet.
- double rad_constant
  Combination of variables that are held constant for any given facet.
- InteractionFacet * facet
  Pointer back to facet that contains this thermal rider.

- bool active

  Flag set to indicate whether the facet to which this rider is attached has a dynamic temperature variability.
- double thermal_power_dump

  Rate at which thermal energy is transfered to the facet from within the vehicle.
- double emissivity

  Fraction of sigma-T^4 (potential for emissive radiation) that is actually emitted.
- ThermalIntegrableObject integrable_object

  The encapsulation of a first order integrator which can optionally be used to integrate the temperature.

Static Public Attributes

- static double cycle_time = 0.0

  Time since the last temperature calculation for the particular model under consideration.

Static Protected Attributes

- static const double stefan_boltzmann = 5.6704004E-08

  Stefan-Boltzmann constant.

Private Member Functions

- ThermalFacetRider & operator= (const ThermalFacetRider &rhs)
- ThermalFacetRider (const ThermalFacetRider &rhs)

Private Attributes

- double next_temperature

  The predicted value of temperature at the next time-step.
- double dynamic_temperature

  The dynamic value of the facet kinetic temperature.

Friends

- class InputProcessor
- void init_attrjeod__ThermalFacetRider ()

8.1.1 Detailed Description

Defining the thermal characteristics of surface facets.

Definition at line 83 of file thermal_facet_rider.hh.

8.1.2 Constructor & Destructor Documentation

8.1.2.1 ThermalFacetRider() [1/2]

```
jeod::ThermalFacetRider::ThermalFacetRider (
            void  )
```

Constructor.

Definition at line 60 of file thermal_facet_rider.cc.

References active, d_temperature, dynamic_temperature, emissivity, facet, heat_capacity, next_temperature, power_absorb, power_emit, rad_constant, and thermal_power_dump.

8.1.2.2 ~ThermalFacetRider()

```
jeod::ThermalFacetRider::~ThermalFacetRider (
            void  )  [virtual]
```

Destructor.

Definition at line 313 of file thermal_facet_rider.cc.

8.1.2.3 ThermalFacetRider() [2/2]

```
jeod::ThermalFacetRider::ThermalFacetRider (
            const ThermalFacetRider & rhs )  [private]
```

8.1.3 Member Function Documentation

8.1.3.1 accumulate_thermal_sources()

```
void jeod::ThermalFacetRider::accumulate_thermal_sources (
            void  )
```

Collects together all surface and internal thermal sources that affect a facet.

Definition at line 82 of file thermal_facet_rider.cc.

References power_absorb, power_emit, and thermal_power_dump.

8.1.3.2 initialize()

```
void jeod::ThermalFacetRider::initialize (
            double temperature,
            double surface_area )
```

Initialize the thermal aspects of the facet.

Parameters

in	*temperature*	temperature of facet Units: K
in	*surface_area*	area of facet surface Units: M∗M

Definition at line 138 of file thermal_facet_rider.cc.

References dynamic_temperature, emissivity, jeod::ThermalMessages::incomplete_setup_error, jeod::Thermal↩
IntegrableObject::initialize(), integrable_object, next_temperature, rad_constant, and stefan_boltzmann.

8.1.3.3 integrate()

```
double jeod::ThermalFacetRider::integrate (
            void  )
```

Runge-Kutta 4th order integration of the temperature variation.

Returns

void

Definition at line 184 of file thermal_facet_rider.cc.

References active, cycle_time, d_temperature, dynamic_temperature, heat_capacity, jeod::ThermalMessages↩
::invalid_integration_operation, next_temperature, pow4, power_absorb, power_emit, and rad_constant.

8.1.3.4 operator=()

```
ThermalFacetRider& jeod::ThermalFacetRider::operator= (
            const ThermalFacetRider & rhs )  [private]
```

8.1.4 Friends And Related Function Documentation

8.1.4.1 init_attrjeod__ThermalFacetRider

```
void init_attrjeod__ThermalFacetRider ( )  [friend]
```

8.1.4.2 InputProcessor

```
friend class InputProcessor  [friend]
```

Definition at line 85 of file thermal_facet_rider.hh.

8.1.5 Field Documentation

8.1.5.1 active

```
bool jeod::ThermalFacetRider::active
```

Flag set to indicate whether the facet to which this rider is attached has a dynamic temperature variability.

trick_units(–)

Definition at line 142 of file thermal_facet_rider.hh.

Referenced by integrate(), and ThermalFacetRider().

8.1.5.2 cycle_time

```
double jeod::ThermalFacetRider::cycle_time = 0.0  [static]
```

Time since the last temperature calculation for the particular model under consideration.

trick_units(s)

Definition at line 95 of file thermal_facet_rider.hh.

Referenced by integrate(), and jeod::ThermalModelRider::update().

8.1.5.3 d_temperature

```
double jeod::ThermalFacetRider::d_temperature
```

Change in temperature.

trick_units(–)

Definition at line 100 of file thermal_facet_rider.hh.

Referenced by integrate(), and ThermalFacetRider().

8.1.5.4 dynamic_temperature

```
double jeod::ThermalFacetRider::dynamic_temperature  [private]
```

The dynamic value of the facet kinetic temperature.

THIS VALUE IS USED ONLY BY THE THERMAL INTEGRATOR, AND SHOULD NOT BE SET EXTERNALLY.↩ trick_units(K)

Definition at line 185 of file thermal_facet_rider.hh.

Referenced by initialize(), integrate(), and ThermalFacetRider().

8.1.5.5 emissivity

```
double jeod::ThermalFacetRider::emissivity
```

Fraction of sigma-T^4 (potential for emissive radiation) that is actually emitted.

trick_units(–)

Definition at line 158 of file thermal_facet_rider.hh.

Referenced by initialize(), and ThermalFacetRider().

8.1.5.6 facet

```
InteractionFacet* jeod::ThermalFacetRider::facet
```

Pointer back to facet that contains this thermal rider.

trick_units(–)

Definition at line 134 of file thermal_facet_rider.hh.

Referenced by ThermalFacetRider().

8.1.5.7 heat_capacity

```
double jeod::ThermalFacetRider::heat_capacity
```

Heat capacity of the facet.

trick_units(–)

Definition at line 120 of file thermal_facet_rider.hh.

Referenced by jeod::ThermalIntegrableObject::compute_temp_dot(), integrate(), and ThermalFacetRider().

8.1.5.8 integrable_object

`ThermalIntegrableObject jeod::ThermalFacetRider::integrable_object`

The encapsulation of a first order integrator which can optionally be used to integrate the temperature.

trick_units(–)

Definition at line 164 of file thermal_facet_rider.hh.

Referenced by initialize().

8.1.5.9 next_temperature

`double jeod::ThermalFacetRider::next_temperature [private]`

The predicted value of temperature at the next time-step.

THIS VALUE IS USED ONLY BY THE THERMAL INTEGRATOR, AND SHOULD NOT BE SET EXTERNALLY.↩ trick_units(K)

Definition at line 179 of file thermal_facet_rider.hh.

Referenced by initialize(), integrate(), and ThermalFacetRider().

8.1.5.10 power_absorb

`double jeod::ThermalFacetRider::power_absorb`

Rate at which energy is absorbed from the environment, vehicle, and surface.

trick_units(–)

Definition at line 106 of file thermal_facet_rider.hh.

Referenced by accumulate_thermal_sources(), jeod::ThermalIntegrableObject::compute_temp_dot(), jeod::↩ ThermalIntegrableObject::integrate(), integrate(), and ThermalFacetRider().

8.1.5.11 power_emit

`double jeod::ThermalFacetRider::power_emit`

Rate at which energy is thermally radiated from the facet.

trick_units(–)

Definition at line 111 of file thermal_facet_rider.hh.

Referenced by accumulate_thermal_sources(), jeod::ThermalIntegrableObject::compute_temp_dot(), integrate(), and ThermalFacetRider().

8.1.5.12 rad_constant

```
double jeod::ThermalFacetRider::rad_constant
```

Combination of variables that are held constant for any given facet.

trick_units(–)

Definition at line 129 of file thermal_facet_rider.hh.

Referenced by jeod::ThermalIntegrableObject::compute_temp_dot(), initialize(), jeod::ThermalIntegrableObject↩ ::integrate(), integrate(), and ThermalFacetRider().

8.1.5.13 stefan_boltzmann

```
const double jeod::ThermalFacetRider::stefan_boltzmann = 5.6704004E-08  [static], [protected]
```

Stefan-Boltzmann constant.

trick_io(∗o) trick_units(–)

Definition at line 171 of file thermal_facet_rider.hh.

Referenced by initialize().

8.1.5.14 thermal_power_dump

```
double jeod::ThermalFacetRider::thermal_power_dump
```

Rate at which thermal energy is transfered to the facet from within the vehicle.

trick_units(–)

Definition at line 148 of file thermal_facet_rider.hh.

Referenced by accumulate_thermal_sources(), and ThermalFacetRider().

The documentation for this class was generated from the following files:

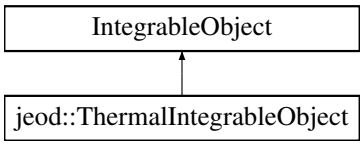
- thermal_facet_rider.hh
- thermal_facet_rider.cc

8.2 jeod::ThermalIntegrableObject Class Reference

Encapsulates a thermal integrator for a facet.

`#include <thermal_integrable_object.hh>`

Inheritance diagram for jeod::ThermalIntegrableObject:



Public Member Functions

- ThermalIntegrableObject ()

  ThermalIntegrableObject default constructor.
- virtual ~ThermalIntegrableObject ()

  ThermalIntegrableObject destructor.
- void initialize (double temperature, ThermalFacetRider &associated_rider)

  Initialize temperature and cache a pointer to the ThermalFacetRider.
- virtual void create_integrators (const er7_utils::IntegratorConstructor &generator, er7_utils::Integration↩ Controls &controls, const er7_utils::TimeInterface &time_if)

  Create the first order integrator for this IntegrableObject.
- virtual void destroy_integrators ()

  Destroy integrators for this IntegrableObject.
- virtual void reset_integrators ()

  Reset the integrator.
- virtual er7_utils::IntegratorResult integrate (double dyn_dt, unsigned int target_stage)

  Integrate the thermal state.
- void compute_temp_dot ()

  Compute emitted power and the time derivative of temperature.
- double get_temp ()

  Get the temperature.
- double get_temp_dot ()

  Get the temperature time derivative.

Data Fields

- bool active

  If true, this IntegrableObject will integrate temperature.

Private Member Functions

- ThermalIntegrableObject & operator= (const ThermalIntegrableObject &rhs)
- ThermalIntegrableObject (const ThermalIntegrableObject &rhs)

Private Attributes

- RestartableScalarFirstOrderODEIntegrator integrator

  Integrates temperature on one facet.
- ThermalFacetRider * rider

  Cached pointer to the associated ThermalFacetRider.
- double temp

  Temperature of the facet.
- double temp_dot

  Time derivative of temperature.
- double t_pow4

  Fourth power of current temperature.

Friends

- class InputProcessor
- void init_attrjeod__ThermalIntegrableObject ()

8.2.1 Detailed Description

Encapsulates a thermal integrator for a facet.

Definition at line 87 of file thermal_integrable_object.hh.

8.2.2 Constructor & Destructor Documentation

8.2.2.1 ThermalIntegrableObject() [1/2]

```
jeod::ThermalIntegrableObject::ThermalIntegrableObject ( )
```

ThermalIntegrableObject default constructor.

Definition at line 47 of file thermal_integrable_object.cc.

References integrator.

8.2.2.2 ~ThermalIntegrableObject()

```
jeod::ThermalIntegrableObject::~ThermalIntegrableObject ( )  [virtual]
```

ThermalIntegrableObject destructor.

Definition at line 60 of file thermal_integrable_object.cc.

References destroy_integrators(), and integrator.

8.2.2.3 ThermalIntegrableObject() [2/2]

```
jeod::ThermalIntegrableObject::ThermalIntegrableObject (
            const ThermalIntegrableObject & rhs )  [private]
```

8.2.3 Member Function Documentation

8.2.3.1 compute_temp_dot()

```
void jeod::ThermalIntegrableObject::compute_temp_dot (
            void  )
```

Compute emitted power and the time derivative of temperature.

Definition at line 163 of file thermal_integrable_object.cc.

References jeod::ThermalFacetRider::heat_capacity, jeod::ThermalFacetRider::power_absorb, jeod::Thermal↩FacetRider::power_emit, jeod::ThermalFacetRider::rad_constant, rider, t_pow4, and temp_dot.

8.2.3.2 create_integrators()

```
void jeod::ThermalIntegrableObject::create_integrators (
            const er7_utils::IntegratorConstructor & generator,
            er7_utils::IntegrationControls & controls,
            const er7_utils::TimeInterface & time_if )  [virtual]
```

Create the first order integrator for this IntegrableObject.

Parameters

generator	Integrator constructor that creates the integrator.
controls	Integration controls that mediates the integrations.
time_if	Unused.

Definition at line 74 of file thermal_integrable_object.cc.

References integrator.

8.2.3.3 destroy_integrators()

```
void jeod::ThermalIntegrableObject::destroy_integrators (
            void  )  [virtual]
```

Destroy integrators for this IntegrableObject.

Definition at line 87 of file thermal_integrable_object.cc.

Referenced by ~ThermalIntegrableObject().

8.2.3.4 get_temp()

```
double jeod::ThermalIntegrableObject::get_temp ( )  [inline]
```

Get the temperature.

Returns

Facet temperature.

Definition at line 125 of file thermal_integrable_object.hh.

References temp.

8.2.3.5 get_temp_dot()

```
double jeod::ThermalIntegrableObject::get_temp_dot ( )  [inline]
```

Get the temperature time derivative.

Returns

Facet temperature time derivative.

Definition at line 134 of file thermal_integrable_object.hh.

References temp_dot.

8.2.3.6 initialize()

```
void jeod::ThermalIntegrableObject::initialize (
             double temperature,
             ThermalFacetRider & associated_rider )
```

Initialize temperature and cache a pointer to the ThermalFacetRider.

Parameters

temperature	– initial temperature
associated_rider	– the associated ThermalFacetRider

Definition at line 148 of file thermal_integrable_object.cc.

References rider, t_pow4, and temp.

Referenced by jeod::ThermalFacetRider::initialize().

8.2.3.7 integrate()

```
er7_utils::IntegratorResult jeod::ThermalIntegrableObject::integrate (
             double dyn_dt,
             unsigned int target_stage )  [virtual]
```

Integrate the thermal state.

Parameters

in	*dyn_dt*	Dynamic time step, in dynamic time seconds.
in	*target_stage*	The stage of the integration process that the integrator should try to attain.

Returns

The status (time advance, pass/fail status) of the integration.

Definition at line 113 of file thermal_integrable_object.cc.

References integrator, jeod::ThermalMessages::invalid_integration_operation, jeod::ThermalFacetRider::power_absorb, jeod::ThermalFacetRider::rad_constant, rider, t_pow4, temp, and temp_dot.

8.2.3.8 operator=()

```
ThermalIntegrableObject& jeod::ThermalIntegrableObject::operator= (
             const ThermalIntegrableObject & rhs )  [private]
```

8.2.3.9 reset_integrators()

```
void jeod::ThermalIntegrableObject::reset_integrators (
             void  )  [virtual]
```

Reset the integrator.

Definition at line 98 of file thermal_integrable_object.cc.

References integrator.

8.2.4 Friends And Related Function Documentation

8.2.4.1 init_attrjeod__ThermalIntegrableObject

```
void init_attrjeod__ThermalIntegrableObject ( )  [friend]
```

8.2.4.2 InputProcessor

```
friend class InputProcessor  [friend]
```

Definition at line 89 of file thermal_integrable_object.hh.

8.2.5 Field Documentation

8.2.5.1 active

```
bool jeod::ThermalIntegrableObject::active
```

If true, this IntegrableObject will integrate temperature.

trick_units(–)

Definition at line 145 of file thermal_integrable_object.hh.

8.2.5.2 integrator

```
RestartableScalarFirstOrderODEIntegrator jeod::ThermalIntegrableObject::integrator  [private]
```

Integrates temperature on one facet.

trick_units(–)

Definition at line 153 of file thermal_integrable_object.hh.

Referenced by create_integrators(), integrate(), reset_integrators(), ThermalIntegrableObject(), and ∼Thermal↩ IntegrableObject().

8.2.5.3 rider

```
ThermalFacetRider* jeod::ThermalIntegrableObject::rider  [private]
```

Cached pointer to the associated ThermalFacetRider.

trick_units(–)

Definition at line 158 of file thermal_integrable_object.hh.

Referenced by compute_temp_dot(), initialize(), and integrate().

8.2.5.4 t_pow4

```
double jeod::ThermalIntegrableObject::t_pow4  [private]
```

Fourth power of current temperature.

trick_units(K∗K∗K∗K)

Definition at line 173 of file thermal_integrable_object.hh.

Referenced by compute_temp_dot(), initialize(), and integrate().

8.2.5.5 temp

```
double jeod::ThermalIntegrableObject::temp  [private]
```

Temperature of the facet.

trick_units(K)

Definition at line 163 of file thermal_integrable_object.hh.

Referenced by get_temp(), initialize(), and integrate().

8.2.5.6 temp_dot

```
double jeod::ThermalIntegrableObject::temp_dot  [private]
```

Time derivative of temperature.

trick_units(K/s)

Definition at line 168 of file thermal_integrable_object.hh.

Referenced by compute_temp_dot(), get_temp_dot(), and integrate().

The documentation for this class was generated from the following files:

- thermal_integrable_object.hh
- thermal_integrable_object.cc

8.3 jeod::ThermalMessages Class Reference

Specifying the message IDs used in the model.

`#include <thermal_messages.hh>`

Static Public Attributes

- static char const * incomplete_setup_error

  Generic error; the model was not set up correctly.
- static char const * invalid_integration_operation

  The integration is invalid, usually because the integration step is too large.

Private Member Functions

- ThermalMessages (void)
- ThermalMessages (const ThermalMessages &)
- ThermalMessages & operator= (const ThermalMessages &)

Friends

- class InputProcessor
- void init_attrjeod__ThermalMessages ()

8.3.1 Detailed Description

Specifying the message IDs used in the model.

Definition at line 81 of file thermal_messages.hh.

8.3.2 Constructor & Destructor Documentation

8.3.2.1 ThermalMessages() [1/2]

```
jeod::ThermalMessages::ThermalMessages (
            void  )  [private]
```

8.3.2.2 ThermalMessages() [2/2]

```
jeod::ThermalMessages::ThermalMessages (
            const ThermalMessages &  )  [private]
```

8.3.3 Member Function Documentation

8.3.3.1 operator=()

```
ThermalMessages& jeod::ThermalMessages::operator= (
            const ThermalMessages &  )  [private]
```

8.3.4 Friends And Related Function Documentation

8.3.4.1 init_attrjeod__ThermalMessages

```
void init_attrjeod__ThermalMessages ( )  [friend]
```

8.3.4.2 InputProcessor

```
friend class InputProcessor  [friend]
```

Definition at line 84 of file thermal_messages.hh.

8.3.5 Field Documentation

8.3.5.1 incomplete_setup_error

```
char const * jeod::ThermalMessages::incomplete_setup_error  [static]
```

Initial value:

```
=
    "utils/thermal_rider/"  "incomplete_setup_error"
```

Generic error; the model was not set up correctly.

trick_units(–)

Definition at line 93 of file thermal_messages.hh.

Referenced by jeod::ThermalFacetRider::initialize().

8.3.5.2 invalid_integration_operation

```
char const * jeod::ThermalMessages::invalid_integration_operation  [static]
```

Initial value:

```
=
    "utils/thermal_rider/"  "invalid_integration_operation"
```

The integration is invalid, usually because the integration step is too large.

trick_units(–)

Definition at line 100 of file thermal_messages.hh.

Referenced by jeod::ThermalIntegrableObject::integrate(), and jeod::ThermalFacetRider::integrate().

The documentation for this class was generated from the following files:

- thermal_messages.hh
- thermal_messages.cc

8.4 jeod::ThermalModelRider Class Reference

Defining the thermal functionality.

```
#include <thermal_model_rider.hh>
```

Public Member Functions

- ThermalModelRider ()
  Constructor.
- virtual ~ThermalModelRider ()
  Destructor.
- void update (InteractionSurface *surface_ptr)
  update the thermal aspects of all facets

Data Fields

- bool active
  Flag to allow thermal variation of facets.
- bool include_internal_thermal_effects
  Flag to include facet-to-facet conduction, and vehicle-to-facet thermal sources and sinks.

Private Member Functions

- ThermalModelRider & operator= (const ThermalModelRider &rhs)
- ThermalModelRider (const ThermalModelRider &rhs)

Friends

- class InputProcessor
- void init_attrjeod__ThermalModelRider ()

8.4.1 Detailed Description

Defining the thermal functionality.

Definition at line 84 of file thermal_model_rider.hh.

8.4.2 Constructor & Destructor Documentation

8.4.2.1 ThermalModelRider() [1/2]

```
jeod::ThermalModelRider::ThermalModelRider (
            void  )
```

Constructor.

Definition at line 53 of file thermal_model_rider.cc.

References active, and include_internal_thermal_effects.

8.4.2.2 ~ThermalModelRider()

```
jeod::ThermalModelRider::~ThermalModelRider (
            void  )  [virtual]
```

Destructor.

Definition at line 83 of file thermal_model_rider.cc.

8.4.2.3 ThermalModelRider() [2/2]

```
jeod::ThermalModelRider::ThermalModelRider (
            const ThermalModelRider & rhs )  [private]
```

8.4.3 Member Function Documentation

8.4.3.1 operator=()

```
ThermalModelRider& jeod::ThermalModelRider::operator= (
            const ThermalModelRider & rhs )  [private]
```

8.4.3.2 update()

```
void jeod::ThermalModelRider::update (
            InteractionSurface * surface_ptr )
```

update the thermal aspects of all facets

Parameters

in	*surface_ptr*	pointer the surface.

Definition at line 65 of file thermal_model_rider.cc.

References active, jeod::ThermalFacetRider::cycle_time, and include_internal_thermal_effects.

8.4.4 Friends And Related Function Documentation

8.4.4.1 init_attrjeod__ThermalModelRider

```
void init_attrjeod__ThermalModelRider ( )  [friend]
```

8.4.4.2 InputProcessor

```
friend class InputProcessor  [friend]
```

Definition at line 86 of file thermal_model_rider.hh.

8.4.5 Field Documentation

8.4.5.1 active

```
bool jeod::ThermalModelRider::active
```

Flag to allow thermal variation of facets.

trick_units(–)

Definition at line 92 of file thermal_model_rider.hh.

Referenced by ThermalModelRider(), and update().

8.4.5.2 include_internal_thermal_effects

```
bool jeod::ThermalModelRider::include_internal_thermal_effects
```

Flag to include facet-to-facet conduction, and vehicle-to-facet thermal sources and sinks.

trick_units(–)

Definition at line 98 of file thermal_model_rider.hh.

Referenced by ThermalModelRider(), and update().

The documentation for this class was generated from the following files:

- thermal_model_rider.hh
- thermal_model_rider.cc

8.5 jeod::ThermalParams Class Reference

A virtual base class for thermal facet parameters, used to add to the parameter lists for specific-model facets in their respective InteractionSurfaceFactorys.

```
#include <thermal_params.hh>
```

Public Member Functions

- ThermalParams ()
  Constructor.
- virtual ~ThermalParams ()
  Destructor.

Data Fields

- double emissivity
  Fraction of sigma-T^4 (potential for emissive thermal) that is actually emitted.
- double heat_capacity_per_area
  Heat Capacity per unit area of surface.
- double thermal_power_dump
  Rate at which thermal energy is dumped (positive) / extracted (negative) into a facet from within the vehicle.

Private Member Functions

- ThermalParams & operator= (const ThermalParams &rhs)
- ThermalParams (const ThermalParams &rhs)

Friends

- class InputProcessor
- void init_attrjeod__ThermalParams ()

8.5.1 Detailed Description

A virtual base class for thermal facet parameters, used to add to the parameter lists for specific-model facets in their respective InteractionSurfaceFactorys.

Definition at line 85 of file thermal_params.hh.

8.5.2 Constructor & Destructor Documentation

8.5.2.1 ThermalParams() [1/2]

```
jeod::ThermalParams::ThermalParams (
            void  )
```

Constructor.

Definition at line 47 of file thermal_params.cc.

References emissivity, heat_capacity_per_area, and thermal_power_dump.

8.5.2.2 ~ThermalParams()

```
jeod::ThermalParams::~ThermalParams (
            void  )  [virtual]
```

Destructor.

Definition at line 58 of file thermal_params.cc.

8.5.2.3 ThermalParams() [2/2]

```
jeod::ThermalParams::ThermalParams (
            const ThermalParams & rhs )  [private]
```

8.5.3 Member Function Documentation

8.5.3.1 operator=()

```
ThermalParams& jeod::ThermalParams::operator= (
            const ThermalParams & rhs )  [private]
```

8.5.4 Friends And Related Function Documentation

8.5.4.1 init_attrjeod__ThermalParams

```
void init_attrjeod__ThermalParams ( )  [friend]
```

8.5.4.2 InputProcessor

```
friend class InputProcessor  [friend]
```

Definition at line 86 of file thermal_params.hh.

8.5.5 Field Documentation

8.5.5.1 emissivity

```
double jeod::ThermalParams::emissivity
```

Fraction of sigma-T^4 (potential for emissive thermal) that is actually emitted.

trick_units(–)

Definition at line 94 of file thermal_params.hh.

Referenced by ThermalParams().

8.5.5.2 heat_capacity_per_area

```
double jeod::ThermalParams::heat_capacity_per_area
```

Heat Capacity per unit area of surface.

trick_units(–)

Definition at line 99 of file thermal_params.hh.

Referenced by ThermalParams().

8.5.5.3 thermal_power_dump

```
double jeod::ThermalParams::thermal_power_dump
```

Rate at which thermal energy is dumped (positive) / extracted (negative) into a facet from within the vehicle.

Used for radiators and the like.trick_units(–)

Definition at line 106 of file thermal_params.hh.

Referenced by ThermalParams().

The documentation for this class was generated from the following files:

- thermal_params.hh
- thermal_params.cc

Chapter 9

File Documentation

9.1 class_declarations.hh File Reference

Forward declaration of classes defined in Thermal_rider model.

Namespaces

- jeod

  Namespace jeod.

9.1.1 Detailed Description

Forward declaration of classes defined in Thermal_rider model.

9.2 thermal_facet_rider.cc File Reference

ThermalFacetRider interaction model.

```
#include <cstddef>
#include <cmath>
#include "utils/message/include/message_handler.hh"
#include "../include/thermal_facet_rider.hh"
#include "../include/thermal_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

Macros

- #define pow4(x) pow4_temp = (x) ∗ (x), pow4_temp ∗= pow4_temp

9.2.1 Detailed Description

ThermalFacetRider interaction model.

9.2.2 Macro Definition Documentation

9.2.2.1 pow4

```
#define pow4(
             x ) pow4_temp = (x) * (x), pow4_temp *= pow4_temp
```

Referenced by jeod::ThermalFacetRider::integrate().

9.3 thermal_facet_rider.hh File Reference

Defining the thermal characteristics of surface facets.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "thermal_integrable_object.hh"
```

Data Structures

- class jeod::ThermalFacetRider

  Defining the thermal characteristics of surface facets.

Namespaces

- jeod

  Namespace jeod.

9.3.1 Detailed Description

Defining the thermal characteristics of surface facets.

9.4 thermal_integrable_object.cc File Reference

Encapsulates an integrator for a single facet.

```
#include <cmath>
#include "../include/thermal_facet_rider.hh"
#include "../include/thermal_integrable_object.hh"
#include "../include/thermal_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.4.1 Detailed Description

Encapsulates an integrator for a single facet.

9.5 thermal_integrable_object.hh File Reference

Define an IntegrableObject class adapted to thermal integration.

```
#include "er7_utils/integration/core/include/integrable_object.hh"
#include "er7_utils/integration/core/include/integrator_result.hh"
#include "utils/integration/include/restartable_state_integrator.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::ThermalIntegrableObject

  Encapsulates a thermal integrator for a facet.

Namespaces

- jeod

  Namespace jeod.

9.5.1 Detailed Description

Define an IntegrableObject class adapted to thermal integration.

9.6 thermal_messages.cc File Reference

Implement the class ThermalMessages.

```
#include "../include/thermal_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

Macros

- #define PATH "utils/thermal_rider/"

9.6.1 Detailed Description

Implement the class ThermalMessages.

9.7 thermal_messages.hh File Reference

Define the class ThermalMessages, the class that specifies the message IDs used in the model.

```
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::ThermalMessages

  Specifying the message IDs used in the model.

Namespaces

- jeod

  Namespace jeod.

9.7.1 Detailed Description

Define the class ThermalMessages, the class that specifies the message IDs used in the model.

9.8 thermal_model_rider.cc File Reference

ThermalModelRider interaction model.

```
#include <cmath>
#include "../include/thermal_model_rider.hh"
#include "utils/surface_model/include/interaction_surface.hh"
#include "../include/thermal_facet_rider.hh"
```

Namespaces

- jeod
  Namespace jeod.

9.8.1 Detailed Description

ThermalModelRider interaction model.

9.9 thermal_model_rider.hh File Reference

Defining the thermal functionality.

```
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::ThermalModelRider
  Defining the thermal functionality.

Namespaces

- jeod
  Namespace jeod.

9.9.1 Detailed Description

Defining the thermal functionality.

9.10 thermal_params.cc File Reference

Thermal Parameter definition.

```
#include "../include/thermal_params.hh"
#include "utils/surface_model/include/interaction_surface.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.10.1 Detailed Description

Thermal Parameter definition.

9.11 thermal_params.hh File Reference

A virtual base class for thermal facet parameters, used to add to the parameter lists for specific-model facets in their respective InteractionSurfaceFactorys.

```
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::ThermalParams

  A virtual base class for thermal facet parameters, used to add to the parameter lists for specific-model facets in their respective InteractionSurfaceFactorys.

Namespaces

- jeod

  Namespace jeod.

9.11.1 Detailed Description

A virtual base class for thermal facet parameters, used to add to the parameter lists for specific-model facets in their respective InteractionSurfaceFactorys.

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