Semantic Design for an Observable Property System

let Participant = Axiom "Associates with observable properties."

let PropertyChangeHandler<Key> = EventSystem -> EventSystem -> EventSystem

and PropertyChangeUnhandler<Key> = EventSystem -> EventSystem

and EventSystem = Axiom "A publisher-neutral event system."

let participantExists : Participant? -> EventSystem -> bool =

Axiom "Check that a participant exists."

let getPropertyOpt<A> : String -> Participant? -> EventSystem -> Maybe<A> =

Axiom "Obtain a participant property if it exists."

let setPropertyOpt<A> : String -> Participant? -> Maybe<A> -> EventSystem -> EventSystem =

Axiom "Set a participant property if it exists."

let handlePropertyChange : String -> Participant? -> PropertyChangeHandler -> (PropertyChangeUnhandler, EventSystem) =

Axiom "Invoke the given handler when a participant property is changed."

Semantic Design for Nu Game Engine

let World = Axiom "The world value."

let Simulant = (SimulantAddress : Address<Simulant>; Participant)

let Game = (GameAddress : Address<Game>; Simulant)

let Screen = (ScreenAddress : Address<Screen>; Simulant)

let Layer = (LayerAddress : Address<Layer>; Simulant)

let Entity = (EntityAddress : Address<Entity>; Simulant)

let Dispatcher = Axiom "Specifies the shape and behavior of a simulant."

let getGame : World -> Game = Axiom "Get the global game handle."

let getScreens : World -> List<Screen> = Axiom "Get all screen handles belonging to the global game."

let getLayers : Screen -> World -> List<Layer> = Axiom "Get all layer handles belonging to the given screen."

let getEntities : Layer -> World -> List<Entity> = Axiom "Get all entity handles belonging to the given layer."

let tryGetParent : Simulant -> World -> Maybe<Simulant> = Axiom "Attempt to get the parent of a simulant."

let getChildren : Simulant -> World -> List<Simulant> = Axtion "Get the children of a simulant."

let getProperty : String -> Simulant -> World -> Any = Axiom "Get the property of a simulant."

let getDispatcher : Simulant -> World -> Dispatcher = Axiom "Get the dispatcher belonging to a simulant."

let getPropertyDefinition : String -> Dispatcher -> World -> PropertyDefinition = Axiom "Get property definition of dispatcher."

let getBehaviors<A, S :> Simulant> : Dispatcher -> World -> List<Behavior<A, S>> = Axiom "..."

let PropertyDefinition =

(Type : Axiom "A value type.",

Default : Any)

let Event<A, S :> Simulant> =

(Data : Any,

Publisher : Simulant,

Subscriber : S,

Address : Address<A>)

let Behavior<A, S :> Subscriber> =

Event<A, S> -> World -> World

Nu Script Semantic Design

let script (str : String) = Axiom "Denotes script code in str."

witness Monoid =

| append = script "+"

| empty = script "[empty -t-]"

witness Monoid =

| append = script "\*"

| empty = script "[identity -t-]"

witness Monad =

| pure = script "[fun [a] [pure -t- a]]"

| map = script "map"

| apply = script "apply"

| bind = script "bind"

witness Foldable =

| fold = script "fold"

witness Functor2 =

| map2 = script "map2"

witness Summable =

| product = script "product"

| sum = script "sum"

let Property = Axiom "A property of a simulant."

let Relation = Axiom "Indexes a simulant or event relative to the local simulant."

let get<A> : Property -> Relation -> A = Axiom "Retrieve a property of a simulant indexed by relation."

let set<A> : Property -> Relation -> A -> A = Axiom! "Update a property of a simulant indexed by relation, then return its value."

let Stream<A> = Axiom "A stream of simulant property or event values."

let getAsStream<A> : Property -> Relation -> Stream<A> = script "getAsStream"

let setAsStream<A> : Property -> Relation -> Stream<A> = script "setAsStream"

let makeStream<A> : Relation -> Stream<A> = script "makeStream"

let mapStream<A, B> (A -> B) -> Stream<A> -> Stream<B> = script "map"

let foldStream<A, B> : (B -> A -> B) -> B -> Stream<A> -> B = script "fold"

let map2Stream<A, B, C> : (A -> B -> C) -> Stream<A> -> Stream<B> -> Stream<C> = script "map2"

let productStream<A, B> : Stream<A> -> Stream<B> -> Stream<(A, B)> = script "product"

let sumStream<A, B> : Stream<A> -> Stream<B> -> Stream<Either<A, B>> = script "sum"