CS 416
Web Programming

MVC details

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Overview

- MVC pattern – in more detail
- Java implementation of MVC
    - Technical underpinnings
- Designing MVC
    - Highlight interactions between model and view
    - View and controller interactions

Model

- Your underlying data
- Manages app data and state
- Not concerned with UI or presentation
- Often persists somewhere
  - Database or network store
- Same model should be reusable, unchanged in different interfaces

View

- What the user sees
- Present the model to the user
  - Desktop view/mobile view
  - Bar chart, pie chart, table
- Allows user to manipulate data
- Does not store any data
- Easily reusable and configurable to display different data

Controller

- Glue that makes app unique
- Intermediary between Model & View
- Updates the view when the model changes
- Updates the model when the user manipulates the view

Controller cont.

- Typically where the **app** logic lives
- **Not** the business logic
- In MVC this sometimes requires thought
  - Model makes business decisions
  - Controller what to display (which view) based on decisions
    - Sometimes this gets a little cloudy as we will see later
  - View how to display that perspective

Why use an MVC model

- Just like you can have “spaghetti” java programs you can have “spaghetti” web apps (yuck!!)
  - Clear responsibilities make things easier to maintain
  - Avoid having one monster class that does everything
- Separating responsibilities leads to reusability
  - By minimizing dependencies, you can take model or view class already written and use it elsewhere
  - Think of ways to write less code

Communication and MVC

- How should objects communicate?
- Which objects know about one another?
- **Model**
  - Example: Customer class
- Not aware of views or controllers
  - Note this does not mean methods aren't created for use by views in the generic sense
- Typically the most reusable
- Communicate generically using
  - Key-value observing
  - Notifications

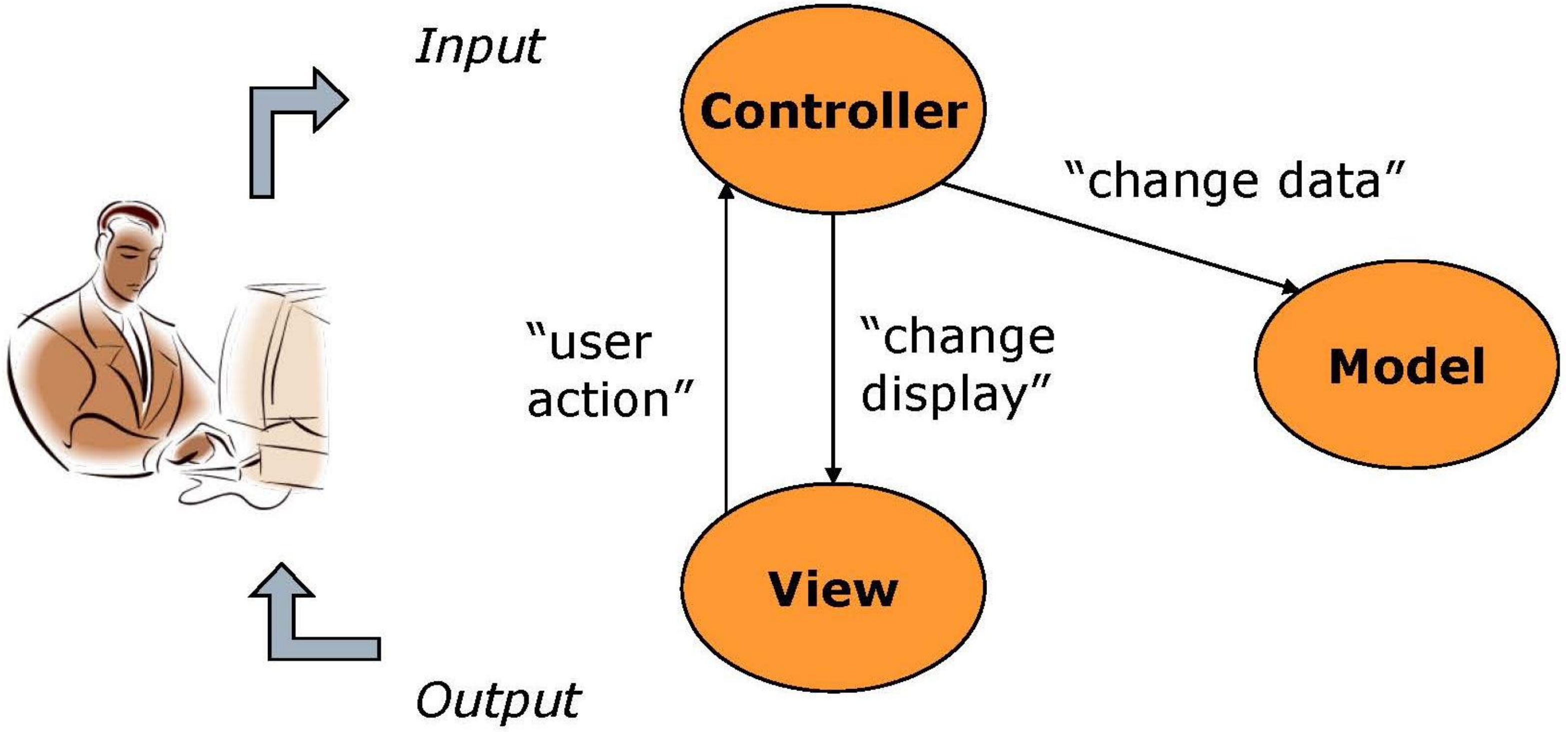
Communication and MVC

- How should objects communicate?
- Which objects know about one another?
- **View**
  - Example: Table view of customers
- Not aware of controller flow/controller context
- Also **tends to be reusable**
- Communicate with controller using
  - Target-action
  - Delegation

Communication and MVC

- How should objects communicate?
- Which objects know about one another?
- **Controller**
- Knows about model and view objects
- Knows and **manages application context** (brains of the application)
- Manages relationships and data flow
- Typically app-specific
    - **Rarely reusable**

Basic interactions in MVC



Mechanics of Basic MVC

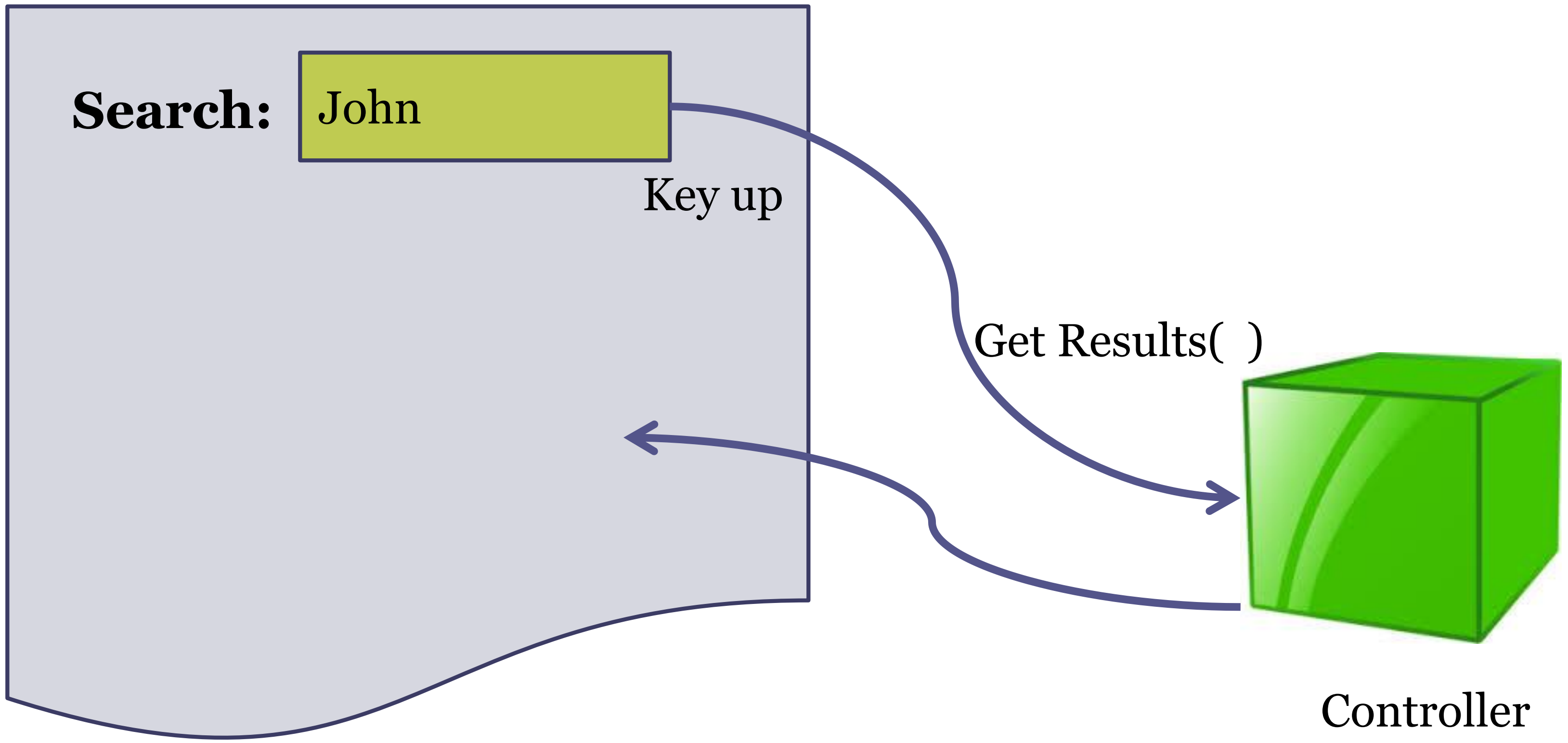
- Setup
  - Instantiate model
  - Instantiate view
- Execution
  - View recognizes event
  - View calls appropriate method on controller
  - Controller accesses model, possibly updating it
  - If model has been changed, view is updated (via the controller)

View Controls - Events

- View objects that allows user to initiate some type of action
- Respond to variety of events
  - Value changed
  - Editing
  - Mouse over
  - Clicks

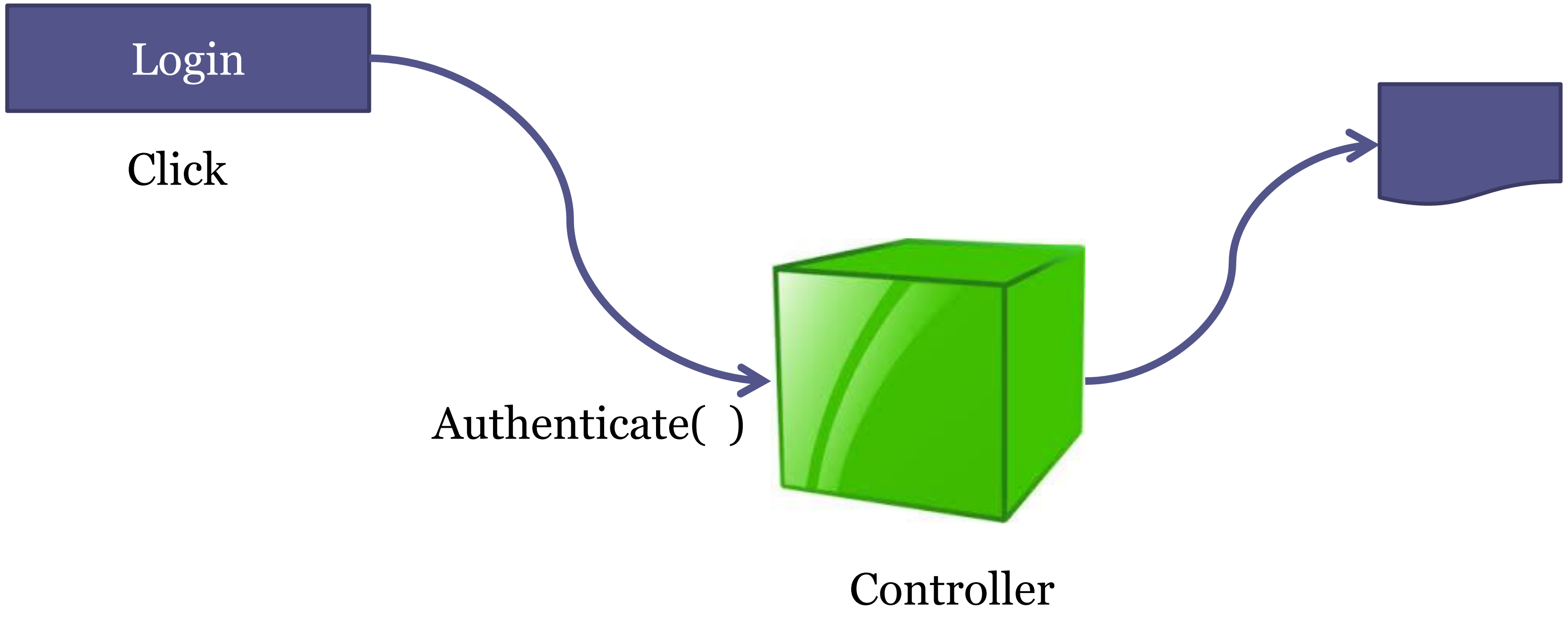
Controls – Delegation

- When an event occurs, controller called to return and/or update content



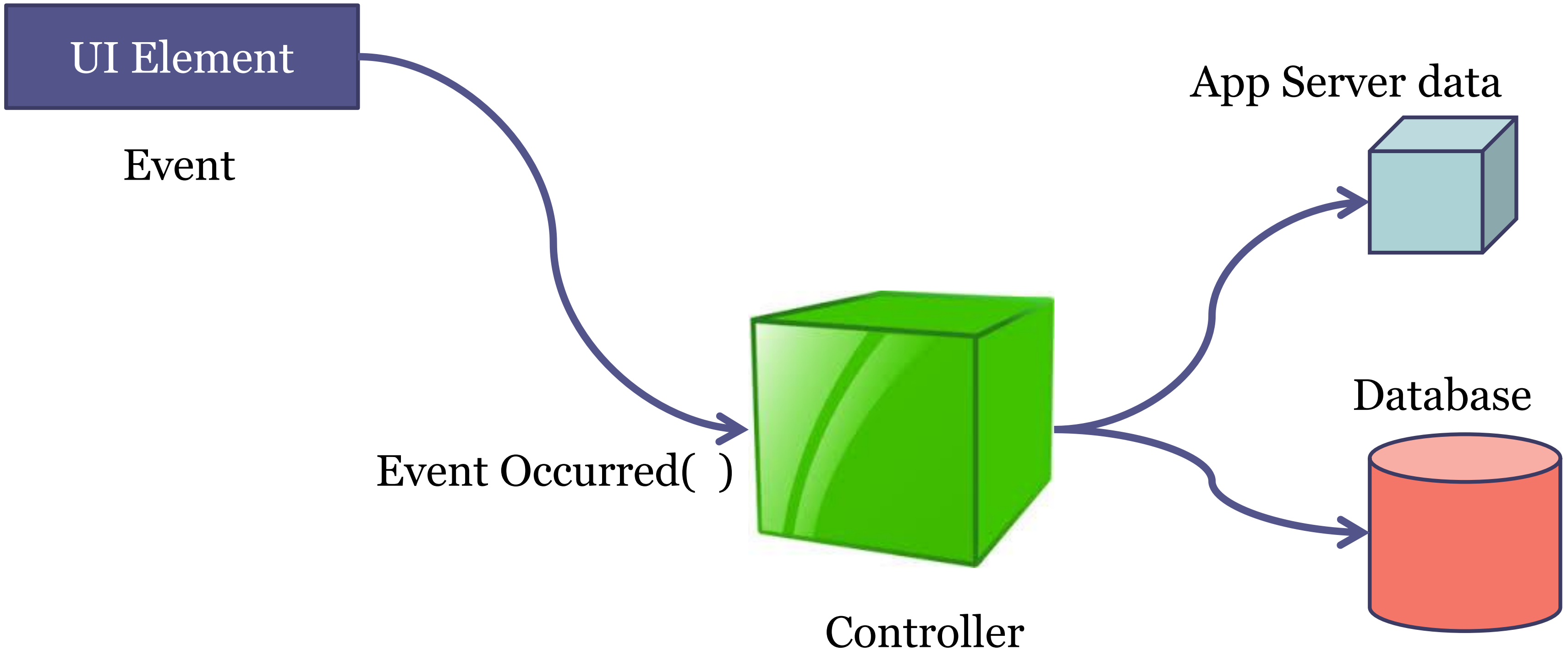
Controls – Target/Action

- When an event occurs, an action is invoked on the controller to decide based on context what view to display next

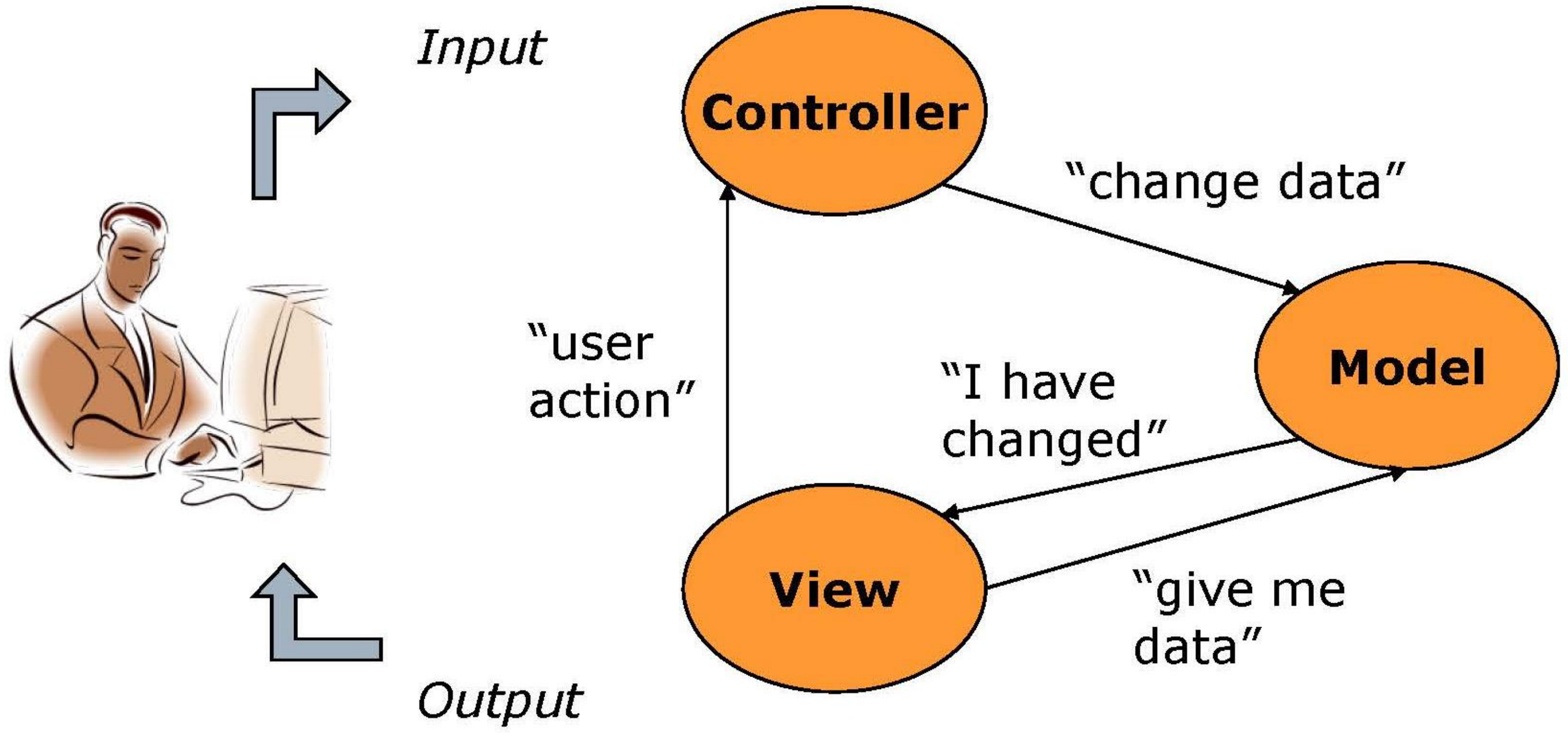


Controls – Persisting

- When an event occurs, controller responsible for persisting if necessary



Extended Interactions in MVC



Running example - car sales application

- Basics
  - Enter car information
    - Make
    - Owner information
    - Mileage
  - Based on information determine application flow
    - Context driven
    - Business driven

MVC - Controller

- Controller is responsible for the **tracking context, flow of the application** and **persistence**
  - Interact with servlet
  - Designed with three primary goals
    - Separate flow from JSP page itself
    - Integrate request context with model (glue between the two)
    - Simplify controller development for common cases (KISS)

Business logic

Business Logic - *encodes the real-world business rules that determine how data can be created, displayed, stored, and changed*

- *Business logic rules do not belong on controller*

Car sale example

- Example rule
  - The rules on selling a car vary based on state, in order to be sold
    - Cars sold in NY and CA must have additional forms completed for joint ownership
    - Cars sold in CA must have a special emissions check completed
  - *In actual business case there are over 50 such variations based on state*
    - **This is business logic**

Business logic and simple navigation

- Rather than having controller determine…
- Have model determine if business rules are met
- Have control decide flow if they are
- Logically
  - On submit
    - Is model valid? (car.valid())
      - YES – Go to next page
      - NO – Go someplace else

Car sale example…

- State rules – business – let model decide
- Note – the information that needs to be considered for the business rules is business rules
    - Example options on a particular form vary by state
    - Rather than have a different JSP page for each state have conditional elements controlled by model
- Example – Model knows which states matter

Car sale example -rules

- Enhancing flow
  - Logic results in more than yes/no
  - Controller direct flow based on model
  - Additional context criteria

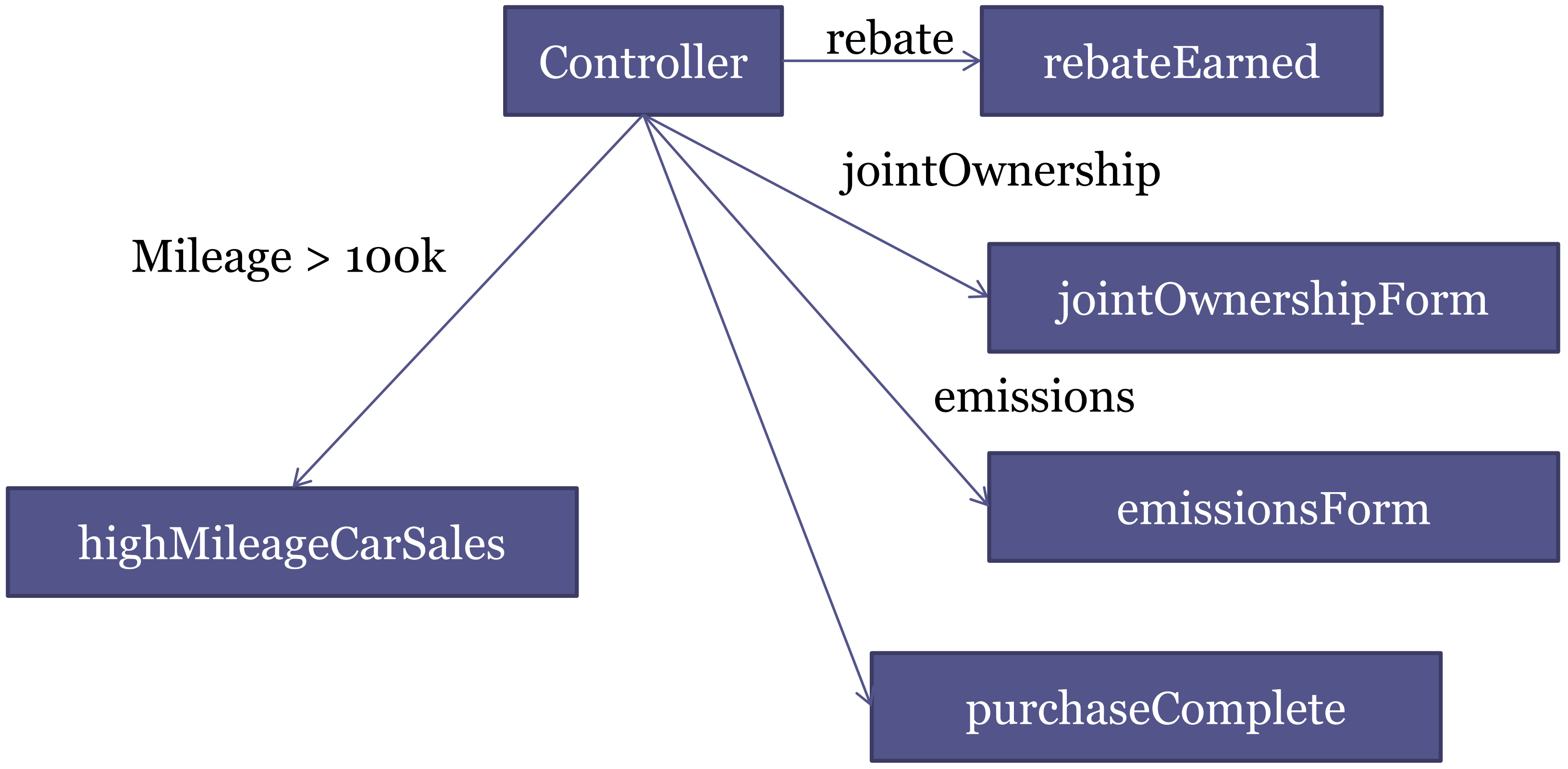
- Additional rule
  - If car has over 100k miles send to another reseller
  - Collection of useful information
    - Questionable – Not intrinsic to business logic, conditional flow may be good solution

Car sale example

- Complex control
  - Flow dictated by view context
  - Flow dictated by model context
  - **Persistence**

Navigation –complex flow driven by controller business logic in model

car sales



Design MVC

- Bank is developing online mortgage application. Basic flow collect personal data, financial data, and home data then display approval/denial. 3 additional possible financial screens dependent on loan status. For home info screen some options state specific
  - Identify potential model
    - Identify psuedo methods on model
  - Identify views
  - Identify controllers
    - How implemented
- Describe points of interaction

In group - Design MVC

- Casino is developing online site. Players tied to profile and funds. Offer multiple electronic games. 3 game screens specific to each game, flow is specific dependent on game state. Betting same, results win page and lose page .
  - Identify potential model
    - Identify psuedo methods on model
  - Identify views
  - Identify controllers
    - How implemented
- Describe points of interaction

In group - Design MVC

- Design online regionalSAT exam. User data similar, but some info collected varies by region. "Pages" of exam, finish one section go to next. Final page exam questions vary by region. Scoring similar.
  - Identify potential model
    - Identify psuedo methods on model
  - Identify views
  - Identify controllers
    - How implemented
- Describe points of interaction

In group - Design MVC

- Design international airline purchase. Assume coming from flights selected. Gather user info page – information necessary from user varies based on departure country, if US display baggage fee warning page then continue, Gather payment info page, confirmation page dictated by ticket (coach, business, first class)
  - Identify potential model
    - Identify psuedo methods on model
  - Identify views
  - Identify controllers
    - How implemented
- Describe points of interaction