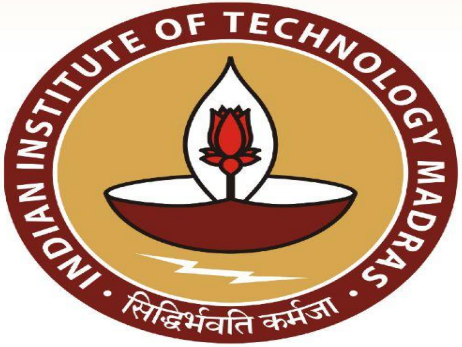


IIT Madras
BSc Degree

Controllers

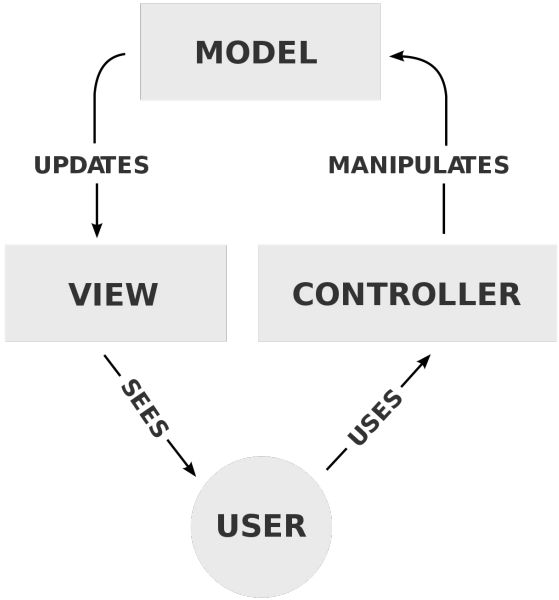
Taking Action

- Origins of MVC
- Request - Response
- Group Actions: Controller
- CRUD
- Routes and Controllers

MVC Origins

Model-View-Controller

- Design pattern - or collection of design patterns
- Originally introduced in context of GUI design in Smalltalk-80
- Many different variants, interpretations...



By RegisFrey - Own work, Public Domain, Wikipedia

From: Trygve Reenskaug

Date: 10 December 1979

MODELS - VIEWS - CONTROLLERS

MODELS

Models represent knowledge. A model could be a single object (rather uninteresting), or it could be some structure of objects. ~~The proposed implementation supports knowledge represented in something resembling *semantic nets* (If I understand Laura correctly)~~

VIEWS

A view is a (visual) representation of its model. It would ordinarily highlight certain attributes of the model and suppress others. It is thus acting as a *presentation filter*.

A view is attached to its model (or model part) and gets the data necessary for the presentation from the model by asking questions. It may also update the model by sending appropriate messages. All these questions and messages have to be in the terminology of the model, the view will therefore have to know the semantics of the attributes of the model it represents. (It may, for example, ask for the model's identifier and expect an instance of Text, it may not assume that the model is of class Text.)

CONTROLLERS

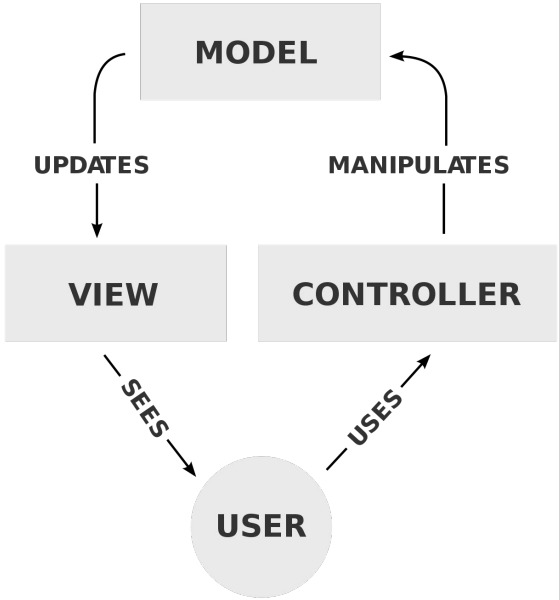
A controller is the link between a user and the system. It provides the user with input by arranging for relevant views to present themselves in appropriate places on the screen. It provides means for user output by presenting the user with menus or other means of giving commands and data. The controller receives such user output, translates it into the appropriate messages and pass these messages on .to one or more of the views.

A controller should never supplement the views, it should for example never connect the views of nodes by drawing arrows between them.

Conversely, a view should never know about user input, such as mouse operations and keystrokes. It should always be possible to write a method in a controller that sends messages to views which exactly reproduce any sequence of user commands.

General Concept - Action

- Take action in response to user input
- Communicate with the model, extract the view



Applicability

- Originally designed for GUI applications
- Separation of concerns - model vs view - and connection through controller
- State of interaction maintained as part of overall system memory

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Web?

- Server does not maintain state of client
- Client is pure front-end to user
- Some of the analogies break down - hence many variants of MVC

Present Context

- MVC is a good conceptual framework to understand separation of concerns
- Breaks down if applied too rigidly
- The web in general does not have the close knit structure of GUI applications needed for MVC
- Other aspects like static typing and type inference of objects also broken in Python-like languages

Apply basic learnings from MVC, but be prepared to stretch

Requests and Responses

Example dynamic web page

- View: page
- Links: clickable to select various options
- Clicking a link **triggers** different behaviours

Course outline

Mapping Signal Processing Algorithms to Architectures

Digital Signal Processing typically involves repetitive computations being performed on streams of input data, subject to constraints such as sampling rate or desired throughput. Often such systems need to be implemented under tight constraints on factors such as timing, resources, power or cost. When they are used in embedded systems, it is often worth the effort to design custom architectures that have much better cost tradeoffs than general purpose computing architectures. This course deals with the analysis of such algorithms, and mapping them to architectures that are either custom designed or have specific extensions that make them better suited to certain kinds of operations. Topics covered include fundamental bounds on performance, mapping to

onlinecourses.nptel.ac.in/noc19_ee70/course?user_email=nitin@ee.iitm.ac.in

NPTE

Week 8

Week 9

INT
imp
para

https://onlinecourses.nptel.ac.in/noc19_ee70/assessment?name=7

Co

How to access the portal

Pre-Requisite Assignment

Quiz: Assignment 0

Week 1

Week 2

Week 3

Digital Signal Processing typically involves repetitive computations being performed on streams of input data, subject to constraints such as sampling rate or desired throughput. Often such systems need to be implemented under tight constraints on factors such as timing, resources, power or cost. When they are used in embedded systems, it is often worth the effort to design custom architectures that have much better cost tradeoffs than general purpose computing architectures. This course deals with the analysis of such algorithms, and mapping them to architectures that are either custom designed or have specific extensions that make them better suited to certain kinds of operations. Topics covered include fundamental bounds on performance, mapping to

Assignment 0

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment.
This is a preliminary assessment - you should make sure that you can answe
the content here is assumed to be already known to you.

Note : This assignment is for practice and it will not be graded.

1) Which of the following operations is implemented by the following equation

$$y(n) = ax(n) + bx(n-1) + cx(n-3)$$

- FIR filter
- IIR filter
- FFT

Request - Response

- Web is based completely on requests and responses
  - Client makes requests
  - Server sends responses
- Basic requests: clicking on link / URL
  - HTTP GET
- More complex requests: *form* submissions
  - HTTP POST

Constraints?

- Any “page” can be requested
- Assignments, quizzes, lectures, general information

Are there common threads?

Example: Gradebook

- Students: ID, name, address, …
- Courses: ID, name, department, year, …
- StudentCourse Relationship: which students are registered for which courses

Example: Gradebook

	A	B
1	**Name**	**IDNumber**
2	Sunil Shashi	MAD001
3	Chetana Anantha	MAD002
4	Madhur Prakash	MAD003
5	Nihal Surya	MAD004
6	Shweta Lalita	MAD005
7	Raghu Balwinder	MAD006
8	Gulshan Kuldeep	MAD007
9	Kishan Shrivatsa	MAD008
10	Purnima Sunil	MAD009
11	Nikitha Madhavi	MAD010
12	Lilavati Prabhakar	MAD011
13	Rama Yamuna	MAD012

	A	B
1	**CourseID**	**Name**
2	EE1001	Introduction to Electrical Engineering
3	AM1100	Engineering Mechanics
4	MA1020	Functions of Several Variables
5	ME1100	Thermodynamics
6	BT1010	Life Sciences

Common Operations

- Create a new student - add name, roll number, date of birth, …
- Create a new course
- Assign student to course
- Enter marks for student / Update marks of student
- View summaries / charts / histograms
- Archive an old course
- Remove graduated students

Some essential functions can be distilled...

CRUD

Types of operations - Create

- Create a new entry
- Must not already exist
- Check within database to avoid conflicts
- Mention mandatory vs optional fields (name, address, mobile number….)

Types of operations - Read

- Get a list of students
- Summarize number of students, age distribution, geographic locations
- Plot histograms of marks

Types of operations - Update

- Change of address
- Update marks
- Change start date of course

Types of operations - Delete

- Remove graduated students
- Delete mistaken entries
- Unenroll student from course

CRUD

Create - Read - Update - Delete

- Originally in context of database operations: nothing to do with the Web
- Reflects cycle of data models
- Databases optimized for various combinations of operations
  - Read-heavy: lots of reading, very little writing or creating
  - Write-heavy: security archive logs

API - Application Programming Interface

- Standardized way to communicate with a server
- Client only needs to know API - not how the server implements the database for example
- CRUD is a good set of functionality for a basic API
    - Usually considered the first level API to implement a web application
- Deals only with the data model life cycle - other control aspects possible

Controllers?

Actions vs Controllers?

- CRUD etc are a set of actions
- Other actions:
  - send email
  - update logs
  - send alert on WhatsApp / Telegram
- Can actions be groups together logically?

  Controller!

Example: Laravel PHP framework

Actions Handled By Resource Controller

Verb	URI	Action	Route Name
GET	`/photos`	index	photos.index
GET	`/photos/create`	create	photos.create
POST	`/photos`	store	photos.store
GET	`/photos/{photo}`	show	photos.show
GET	`/photos/{photo}/edit`	edit	photos.edit
PUT/PATCH	`/photos/{photo}`	update	photos.update
DELETE	`/photos/{photo}`	destroy	photos.destroy

Summary

- Actions: interaction between view and model
- Controller: group actions together logically
- API: complex set of capabilities of server
- Interaction through HTTP requests
- HTTP Verbs used to convey meanings

Rules of Thumb

- Should be possible to change views without the model ever knowing
- Should be possible to change underlying storage of model without views every knowing
- Controllers / Actions should generally NEVER talk to a database directly

In practice:

- Views and Controllers tend to be more closely interlinked than with Models
  - More about a way of thinking than a specific rule of design

Routes

Web applications

- Client-Server model
- Stateless: server does not know the present state of the client
  - Must be ready to respond to whatever the client requests without assuming anything about the client
- Requests sent through HTTP protocol
  - Use variants of the GET, POST (Verbs) to convey **meaning**
  - Use URL (Uniform Resource Locator) structure to convey **context**

Routing: mapping URLs to actions

Python Decorators

- Add extra functionality on top of a function
- “@” - decorators before function name
- Effectively function of a function:
  - Take the inner function as an argument
  - Return a function that does something before calling the inner function

Basic routing in Flask

```
from flask import Flask
app = Flask(__name__)

@app.route("/")
def home():
    return "Hello World!"
```

HTTP verbs

```
@app.route('/', methods=['GET'])
def index():
    ...
@app.route('/create', methods=['POST'])
def store():
    ...
```

CRUD-like functionality

```
# Assume 'index', 'store' etc are functions


@app.route('/', methods=['GET'])(index)
@app.route('/create', methods=['POST'])(store)
@app.route('/<int:user_id>', methods=['GET'])(show)
@app.route('/<int:user_id>/edit', methods=['POST'])(update)
@app.route('/<int:user_id>', methods=['DELETE'])(destroy)
```

Summary

- Flask is not natively MVC
  - But MVC is more a way of thought than a framework
- Simple URL routing
- Helpers to do large scale routing of common functions

Structure the application with separation of concerns in mind

- MVC just one way to achieve clean design