

# Web Interface for MATLAB

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**Abstract-** Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and unconfined with minimal management effort. Software is rapidly moving from the desktop to the Web and smart phones. Our work mainly targets the learning community by providing an efficient web interface for MATLAB by coalescing the two major concepts called cloud computing and open source which helps to diminish the troubles of portability, compatibility, power and storage space by making use of the concept of cloud compiler. And our MATLAB compiler allows a user to pick up the fastest or the most convenient tool to compile the code and remove the errors. The validity of our approach is then verified with the experimental results. This paper discusses implementation of Web based interface for compilation and execution of MATLAB language codes. Users can edit, write, compile, debug and store their code on server. Users need not to spend their time for finding and installing an IDE for different languages. User can use IDE in any device like PC, tablet and mobile devices which has browser with internet connection. Web Based IDE can be used in low configuration systems also.

## I. Introduction

Web interface for MATLAB portends a major change in how we store code, code editing and auto ident. Instead of running programs and data on an individual desktop computer, everything is hosted in the server machine, a nebulous assemblage of computers and servers accesses via the internet. Cloud computing lets to access all your applications and documents from anywhere in the world, freeing you from the confines of the desktop and making it easier for group members in different locations to collaborate. Nowadays, web-based educational environments such as interfaces, virtual and remote laboratories, etc. are widespread used in engineering education due to an extremely easy, fast, and efficient way of training and learning. Users/remote students can easily access a web-based educational environment over the Internet [9]. The main objective of this presented work is to design and implement a web-based educational environment using MATLAB Web Figure for engineering education. An important property of the developed web-based educational interface can run with standard server services without needing any other software on server. Users/students can

easily access a web-based educational environment using only a web browser through a device such as PC, laptop, PDA, or mobile phone connected to the Internet[9]. In addition, employing the .Net. In this synopsis we will try to cover some important topics like goal of project, problem domain, solution domain, future aspects, conclusion etc. in this paper discusses the implementation of web based MATLAB interface for compile and run the code.

WHY web interface for MATLAB needed

- Provides common platform for sharing data
- Enables easier sharing of code and results with the entire research community
- Single web based environment can provide easy access to all analysis tools
- Web interface can also be used to perform batch processing tasks more easily

MATLAB Compiler lets you share MATLAB programs as standalone applications or shared libraries for integration with common programming languages. Applications and libraries created with MATLAB Compiler use the MATLAB Compiler Runtime (MCR), which enables royalty-free deployment to users who do not have MATLAB[6]. You can package the MATLAB Compiler Runtime with the application or have your users download it during Installation Learn more about MATLAB Compiler support for MATLAB and toolboxes.

As the computers evolve, size and the complexity of software production increased. With this increasing complexity, accomplishing tasks such as code editing, build automation and debugging started getting more and more difficult. Solution for this problem of programmers is found to be Integrated Development Environments which are commonly referred as IDE's. Although IDE's are life saver for programmers, these software applications have couple of drawbacks. Local systems IDE's are installed on a system and one need to use that computer to use features of IDE and develop the software. Stand alone IDE high computer resources, as IDE's supported more facilities to the programmer, they require much more computer resources, especially memory and CPU, which may not be available all the time. Most of the desktop based IDE's require the development environment to be set up on their machines. This development environment requires language specific

integrated development environment like eclipse or visual studio to be downloaded and configured within the user's machine. If the user decides to work on a different machine the entire development kit and IDE has to be installed in the new system which makes the process tedious and extremely inconvenient. Web based IDE thus provides a solution to the given problem and gives user the flexibility to start a web browser and open his/her project. The basic requirement here is that the user must have access to an internet connection to be able to connect to the Web IDE. We will install all programming development environment on a server.

## II. Literature Survey

Many efforts have been made to implement online compiler and runtime environments in past few years. In this section we briefly discuss recent developments.

Previous available online compiler provide only facility of compilation to end user, means client only write data in input box and click the run code or execute code button for getting output[4]. All process related with program execution will perform on server machine, client only get result on output box. Most of the web-based applications (interfaces, virtual and remote laboratories, etc.) Realized using special software such as JAVA, C#, LabVIEW need downloading and installing some special programs. Using them introduces several disadvantages such as extra workload and slow response times. On the other hand, software using the server technology does not require downloading and installation of any programs[9]. Compared to other software, MATLAB presents a lot of additional features such as large library, analysis tools, powerful numeric computation capability, and visualization. Also, MATLAB enables supporting the server technology for applications with its web server toolbox. But, MATLAB builder NE has replaced the MATLAB web server [7]. In the field of research and education this is very important and necessary.

## IV. SYSTEM DESIGN

### A. Architecture

Users are essential to inventory through the web interface. Whenever a new user registered, all the required data will be created in the database and a predefined workspace will be assigned for the user. Later, user will be able to login and logout the system anytime.

### B. The Developed System Architecture

Figure 1 shows the proposed system architecture comprised of two layers namely a server layer and a client layer.

The Server Layer: It takes data packets through a web browser or LAN network and processes them for analysis, calculation, and visualization using MATLAB. An important note is that MATLAB is required to have set up on the server only, where the developed web-based educational interface using

MATLAB builder NE and .NET technology is merely enough. Then, the Server sends to remote users (client layer) the processed data via web browser over Internet.

The Client Layer: All the remote users can access to the server with only web browser without downloading and installation of any programs. Therefore, users only need the means connected to Internet such as pc, laptop, PDA. They take processed data and visualization data utilizing MATLAB builder NE from the server. Fig. 1

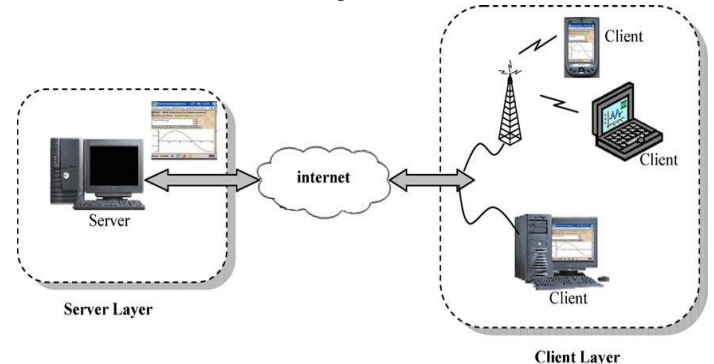


Figure 1 : Architecture of Web Interface for MATLAB

### C. Design Stages of the Web-Based Educational Interface

In the development of the web-based educational interface, the MATLAB builder NE with Web Figure [10], ASP.NET as .NET technology (www.asp.net) and Microsoft Visual Web Developer [11] have been employed. In this section, design stages of the web-based educational interface are presented step-by-step. The MATLAB builder NE is an additional product of MATLAB compiler. It enables .Net programmers using CLS-compliant languages such as C#, VB.Net, and C++ to access MATLAB functions. It basically converts the .Net codes to the MATLAB functions [10]. MATLAB builder NE enables data convert, data sort, and array shape using MWArray.dll file. This file must be added to the application as reference in order to convert from used data and array to MATLAB data and vice versa [10-11]. The Web Figure feature in MATLAB builder NE allows illustrating MATLAB figures in web page and making visual processes (3-D, zoom, etc.) on figures. Thus, user can easily realize visual applications using only web browser over Internet without needing MATLAB or other programs [10-11].

The process of creating .Net component with MATLAB builder NE is presented in Figure 3. To constitute the .Net component with the .dll extension, a MATLAB function within the .m file is defined[8]. In order to utilize the Web Figure feature, figure must be also defined in the MATLAB function. As seen in Figure 3, firstly the '.m file' is composed and then run in the deployment tool for compile process. Thus,

a new project is constituted and the '.m file' is added to the class in the project. Finally the project is compiled [10-11].

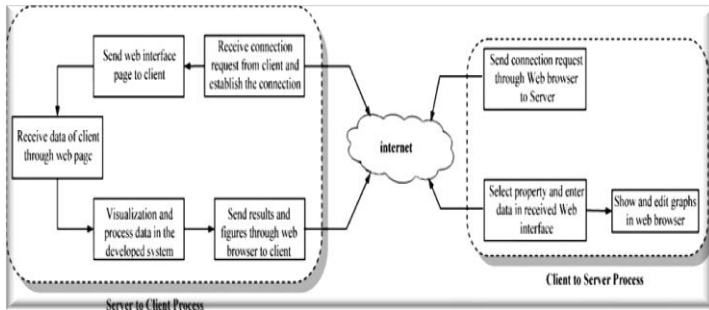


Figure 2 : Process Diagram of IDE

The web-based educational interface for learning digital modulation techniques in the communication systems course is presented through two application examples. The digital modulation codes utilized in this study are obtained and derived from Refs. [12–14].

**B. Technology**

*Visual Studio 2010*

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop console and graphical user interface applications along with Windows Forms or WPF applications, web sites, web applications, and web services in both native code together with managed code for all platforms supported by Microsoft Windows, Windows Mobile, Windows CE, .NET Framework, .NET Compact Framework and *Microsoft Silverlight*.

*MS SQL Server*

Microsoft SQL Server is a relational database management system developed by Microsoft Inc. As a database, it is a software product whose primary function is to store and retrieve data as requested by other software applications, be it those on the same computer or those running on another computer across a network .

*JavaScript*

JavaScript is a technique for manipulating HTML documents in the browser. This is often called client-side scripting. It allows the page author to incorporate facilities such as buttons that change in appearance when you move the mouse over them and menus that expand.

*'j' Query*

jQuery is a fast and concise JavaScript Library that simplifies HTML document traversing, event handling, animating, and Ajax interactions for rapid web development.

*Ajax*

Ajax (also AJAX an acronym for Asynchronous JavaScript and XML) is a group of interrelated web development techniques used on the client-side to create asynchronous web

applications. With Ajax, web applications can send data to, and retrieve data from, a server asynchronously (in the background) without interfering with the display and behavior of the existing (JSON is often used instead), and the requests do not need to be asynchronous.

**C. Implementation**

We have implemented Web Based IDE in ASP.NET using C# as frontend and SQL Server as a backend. User first creates a login ID to access the compilers. After creating login ID user must login in the system. After login user select the compiler for which he wants to use. After selecting the compiler user type his code in the editor and use the button or shortcut keys to compile and execute the code. The output is displayed on the output tab. Although the frontend is designed to be as simple as possible with only a few commonly used options, it is sufficiently functional and can be used quickly. Proper validations are used. User code is submitted to server. Server side code compiles the code and displays warning message or show the results on the client window. After successful compilation compiler generate execute file (exe). This exe file produce the desired output for the given source code.

Following figures show the Web Based Interface design and working.

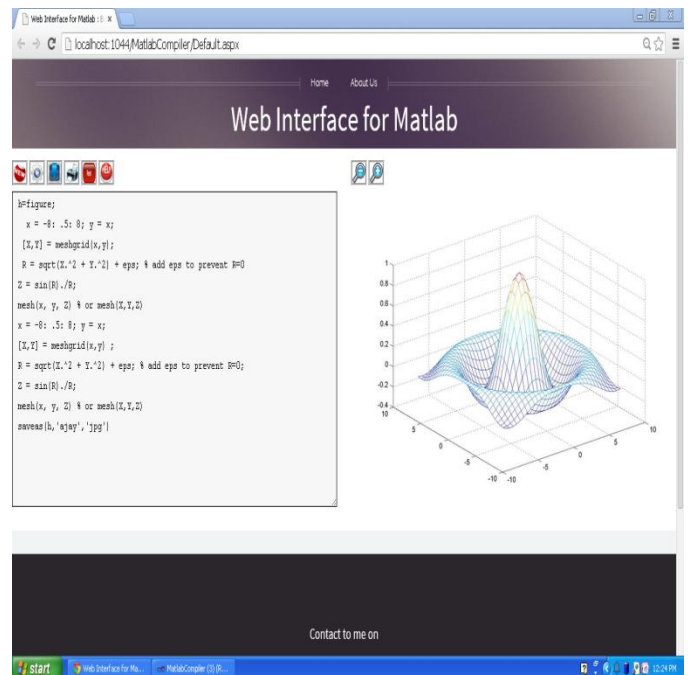


Figure 3 : Interface for 3D Figure in MATLAB

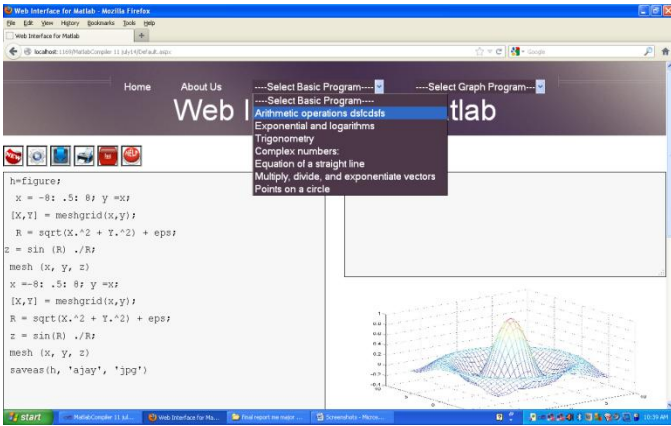


Figure 4: Inbuilt programs list

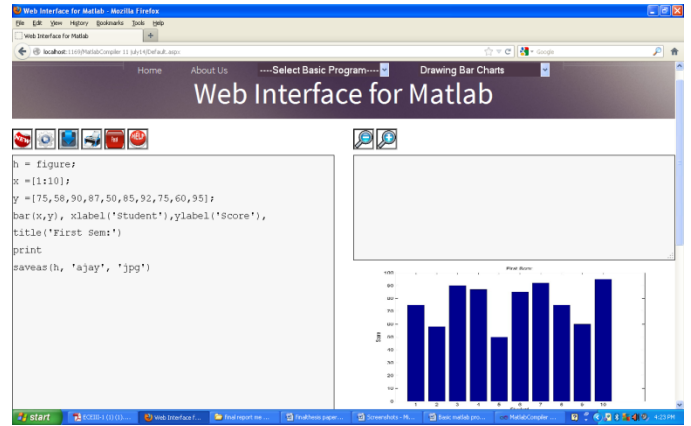


Figure 7 : Interface for 2D bar chart MATLAB Program

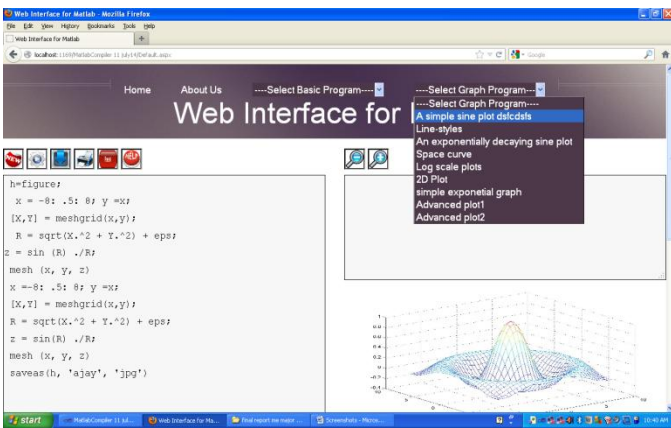


Figure 5: Inbuilt programs list

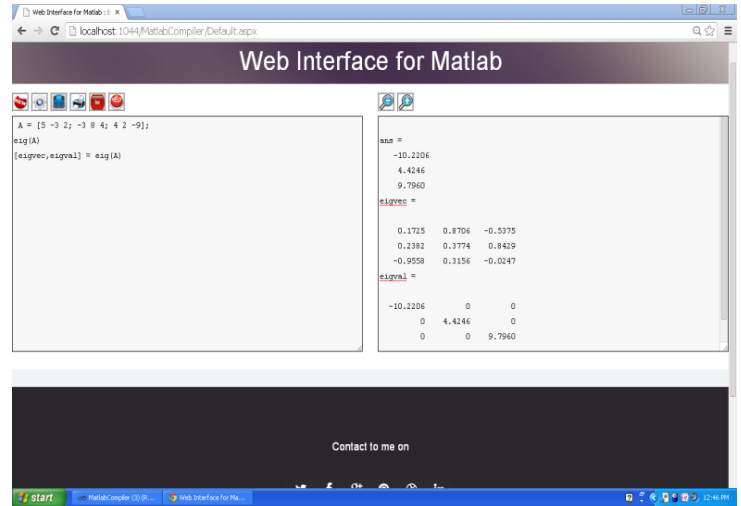


Figure 7 : Interface for MATLAB Program

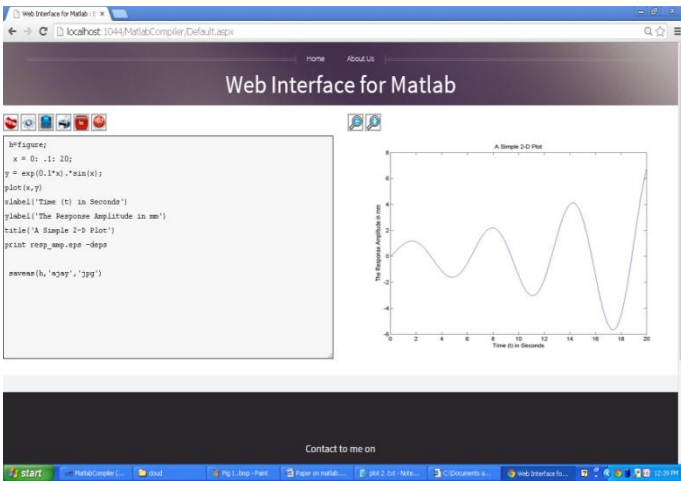


Figure 6 : Interface for 2D MATLAB

## V. Benefits of Research Portal

- Provides common platform for sharing data
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## VI. Conclusion

Possible to create more interactive applications, e.g: zooming into images. Eliminates the need for each user to buy MATLAB and all toolboxes[6]. Less expensive alternative since it is based on freely available software/libraries. MATLAB workspace is not retained. All variables and data generated by an application is lost upon completion of the program. Results need to be recomputed for subsequent analysis by other applications[6]. Does not provide interactivity with MATLAB graphical output. Difficult to track users. The system does not have a concept of sessions. It does not provide network security [6]. No data encryption provided. User authentication also not provided. Provide ability to upload and download data as well as MATLAB code. Provide bulletin board for exchange of ideas, problem discussion, etc. Develop administrator tools for portal[6]. Make provisions for adding/removing users also available tools for portal administration. Provide comprehensive documentation for the portal also.[6]

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