



(RESEARCH ARTICLE)



Shape function for triangular element: An android base application

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Abstract

Since the Smart phone technology is booming high and getting popular in every one daily life. Today's more than 90% people today use smart phone. Moreover, android mobile operating system provides most of the application freely available for the smart phone users. So in this research paper, we combine the concept of android technology and Mathematics, then we present "Shape Function for Triangular Element" an android application design to help Engineering Master Degree students and Researchers to easy calculate the value of Mathematical Shape Function for Triangle. We describe the design and implementation process, calculation process and result of usability evaluation. As after deployment, this app is freely available any android smart phone user. Using this app user can easily solve the complex shape function calculation problem just by inputting the values and get accurate result with a blink of eyes.

Keywords: Shape Function; Researchers; Smart phone; Triangle; Android

1. Introduction

Now a days as an online activities are shifting from computer to smart phone devices, so there is need to shift method of learning also from computer to smart phone devices. Android Smart Phone users will download android application freely from the android market. Due to this android feature, in our research paper we have combined the concept Mathematics to utilize the maximum benefit of android technology in education sector also.

The shape function is the function which interpolates the solution between the discrete values obtained at the mesh nodes. Therefore, appropriate functions have to be used and, as already mentioned, low order polynomials are typically chosen as shape functions. [8]

Android is an Operating System for mobile device and also a platform to developed key application for the Smart Phone. Java Programming Language is used to developed Android Application by using Android SDK tools and API.

- **Android Architecture:** Android provides an open source development platform that offers developers the strength to build extremely powerful applications. Android help Developers to take free advantage of the device hardware, access location information, run background services, divert call and messages, etc.

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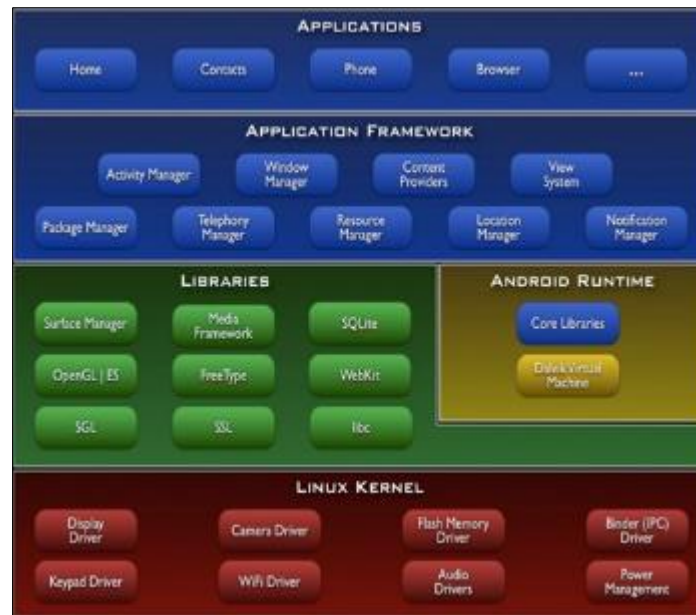


Figure 1 Android Framework

For developing key application developers take the advantages of same framework APIs. Application architecture use reusability features of components. Once the application has been published, its capabilities are reuse by other applications. Thus it allows the one component to replace by others components. [7]

Our android application “Shape Function for Triangular Element” is targeted for easy and accurate solution for complex Shape Function for triangle. Our application has been designed for Engineering Master Degree students and Researchers. Our application is GUI and so user friendly that user have to just input the value of triangle endpoints (X_1, Y_1) , (X_2, Y_2) and (X_3, Y_3) then after that depending upon the input values required matrix will be design and complex equation will be solved on the fly. Our application will provide so accurate result, which will difficult to obtain manually.

Objectives

The primary objective to introduce our application is to provide the GUI and User friendly environment to obtain accurate result of Mathematical Shape Function for triangle. This application require simple three X and Y endpoints of triangle as an input value and depending upon these values, system will generate different required matrix and generate complex equation and provide accurate results which will very useful to Engineering Master Degree students and Researchers.

2. Problem statement

After Various problems have been identified during study intensive study.

Manually Calculation of Shape Function for triangle required deep concentration and also it is a time consuming process. Moreover it will not give any guarantee that each and every time calculation will provide accurate and correct result.

Mostly there is no websites which will provide automatic calculation of the Shape Function.

3. Methodology

To solve the problems mention in problem statement. We have design an android application “Shape Function for Triangular Element” that will calculate the shape function on the fly and provides always accurate and correct result. It will save lot of time of students and researcher which is wasted in manually calculation. As this application is freely available user can download and use as and when required. No other this type of solution is available right now.

3.1. Design and Implementation

Below Figure show the Design and implementation of our application. It is the start point of application on clicking Start button our application start and ready to take input from the user.

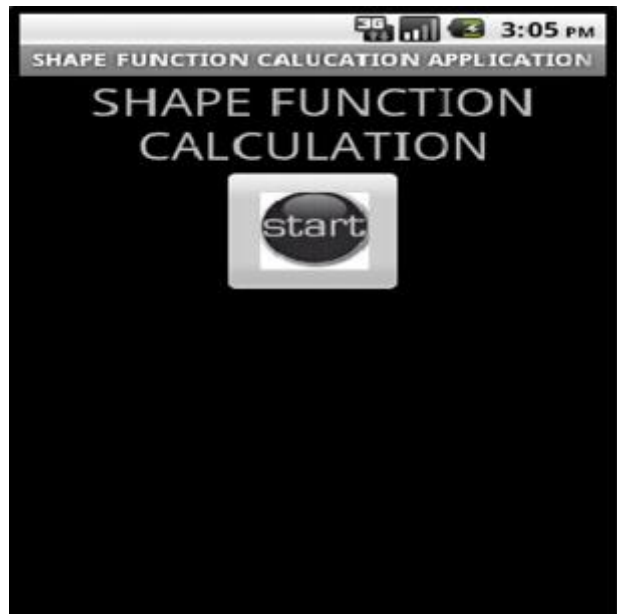


Figure 2 Starting stage of Application

After clicking on start button in our application, another page is open which ask input from the user to calculate shape function for triangle. Below figure show the input page where user have to enter three points value of triangle i.e. (X_1, Y_1) , (X_2, Y_2) and (X_3, Y_3) . Depending upon these input values further calculation will proceed.

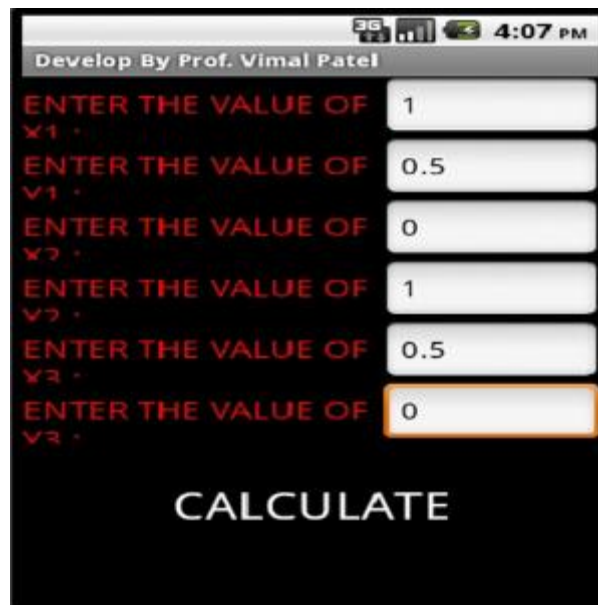


Figure 3 Triangle 3 end points input value

After inputting the value of the endpoints of triangle, the equation is automatically created for each end point. Where U_1 , U_2 and U_3 are the equation for end point (X_1, Y_1) , (X_2, Y_2) and (X_3, Y_3) respectively. C_1 , C_2 and C_3 are the 3 variables of the each equation.

Now depending upon the equation, the 3 X 3 matrix is created for each value of the variable 'C'. After that inverse of that matrix will be calculated and display to the user.

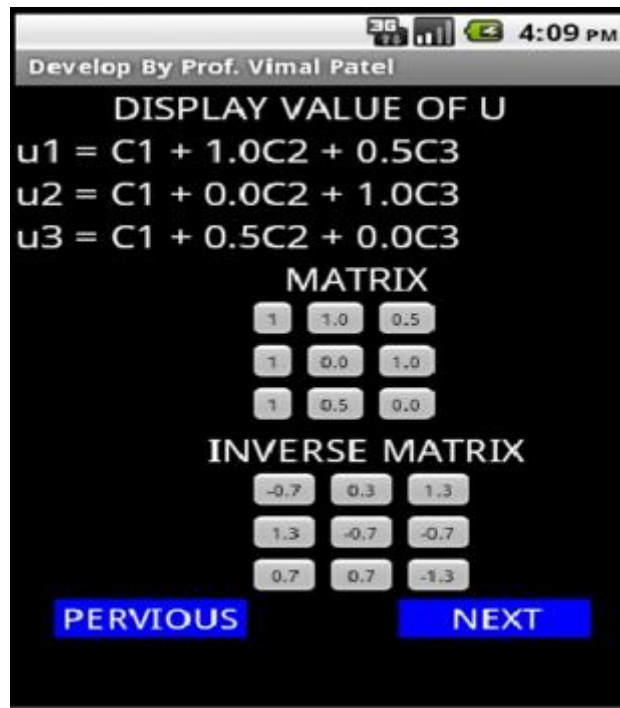


Figure 4 Generation of Equation, Matrix and Inverse Matrix

Now depending upon the inverse matrix another equation for C1, C2 and C3 is created. For each point U1, U2, U3 value is calculated and then depending upon this equation, another equation has to be created i.e.

$$u_n = C_1 + C_2X + C_3Y$$

This equation is created now by substituting each value of C1, C2 and C3. Finally to proceed to obtain result value of shape function for each end points of triangle.

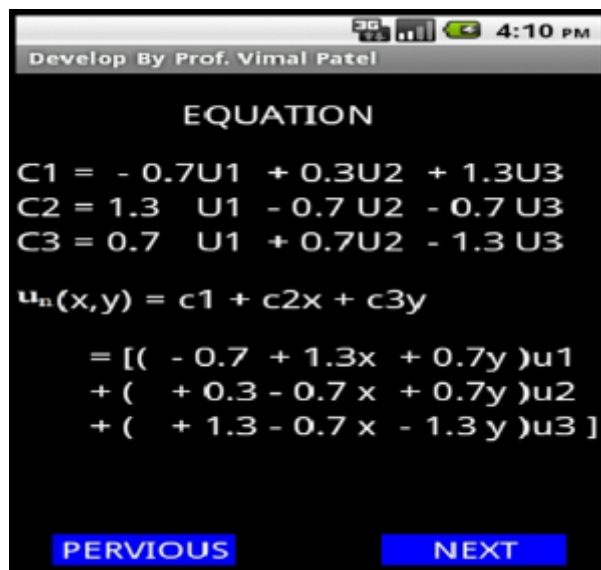


Figure 5 Equation generation from Inverse Matrix

Finally, after creating and calculating different equation we will obtain final accurate values Shape function values of each endpoints of the triangle.

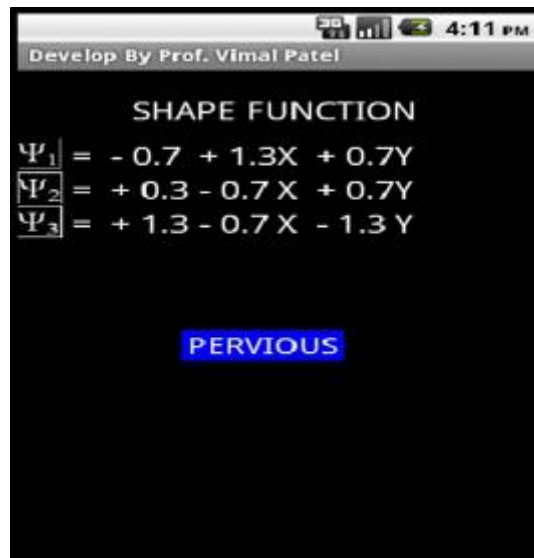


Figure 6 Final result of Shape function Values of triangle

This way how all complex equation is created and calculated from the input endpoint of the triangle and finally value of the Shape Function of triangle will be obtain accurately.

4. Conclusion

From the above study it is conclude that an Android Application “Shape Function for Triangular Element” application will easily create, calculate and provide accurate result for the Shape Function. It is very useful for Engineering Master Degree students and research because it save lot of time of manually calculation of equation and it always gave accurate result.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed

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