ISSN:0975-9646

Ashoka S. B et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 7 (3) , 2016, 1483-1485

Basic Principles of Animation Techniques used to Demonstrate DBF Mathematical Model Flow through a Rectangular Porous Channel

Ashoka S. B.[a], Sowmya S. B[b].

[a] Research Scholar, Department *of Computer Science and Applications,*
Bangalore University, Bangalore - 560 056,
[a]Asst. Professor, *Department of Computer Science,*
[b]Asst. Professor, *Department of Mathematics,*
Maharani's Science College for Women
Bangalore–560 001, INDIA

Abstract-The Basic Principles are set of rules are universally accepted as the cornerstone of any animation production and can be applied directly to the way computer character animation is produced. Follows are brief descriptions of those principles that can also be applied to facial animation. Squash and Stretch, Anticipation, Staging, Pose to Pose, Follow Through, Slow in and Slow out, Arcs, Secondary Action, Timing, Exaggeration, Solid, Drawing, Appeal. Animating is a very popular area of filmmaking and it's not a new thing either. Animation in films goes far back into the ancient's days with most forms of animations, you will have to be weary about what video camera you use. Just picking out the family camcorder may not work in this case, because there are certain functions you need to animate. On the camera you use, you need a "stop motion" mode. In this paper we are mainly demonstrate DBF flow through an rectangular porous channel and their results platen. Second things is how differential equation form parameters velocity profile in unidirectional flow in rectangular porous channel with the help of Maya polygon is used to create 3 dimensional views in porous media with create an expression to animate velocity profile platen in different set of parameter. The homotopy continuation method is found to be very effective in capturing boundary and inertia effects in flow through porous media. Further, it succeeds in giving the required solution for large values of Forchheimer number when shooting method fails to do so.

Keywords: Production, HCM, SM, DBF, DTM, Porous media, Rectangular Channel.

INTRODUCTION

The utility of porous media in practical applications is well known at the present time to merit more than a not-so-detailed exposition (see Nield and Bejan[1], Vafai[2], Rudraiah et al[3]). In the light of the above observation we merely reiterate the advocacy of umpteen number of eminent researchers to have boundary and inertia effects in flow equations of porous media. To cite a few recent works, we draw attention to the work of Skjetne and Auriault[4] that provides new insights on steady, non-linear flow in porous media. Also the work of Calmdi and Mahajan[5] presents the non-linear, non-Darcy equation as an excellent candidate for description of flow in metal foam porous media. Khaled and Vafai draw us from extra-corporeal application situations into corporeal flows. Their work suggests a non-linear flow model for high perfused skeletal tissues. In all these applications, and many more, high flow rate and /or high permeability in porous media warrants the quantification of the departure from Darcy's law in terms of Brinkman friction and super-linear drag, the former arising due to solid boundaries and the latter caused by form drag due to the solid matrix. Restricting our attention to uni-directional flows, we call attention to two extremely important works of Vafai and Kim, and Nield et al that deal with forced convection in a channel filled with a porous medium. A steady, uni-dimensional, non-linear, non-Darcy flow was assumed in these works. The above two works concern exact solutions of the non-linear two-point boundary-value problem arising in the study. The non-linearity in the governing quasi-linear differential equation is a quadratic function of velocity. In literature, the nomenclature attached with this friction is either after the name of Forchheimer or Ergun. We follow the classic mathematical works and prefer use of the name of Forchheimer to Ergun on reasons of maintaining continuity in nomenclature and not adding to the confusion in literature over different model names. In so far as the Darcy friction and viscous shear is concerned, there is no debate at the present time on having two viscosities in the equation- actual fluid viscosity and effective viscosity (see Lauriat and Prasad and Givler and Altobelli). In the present problem we consider the two non-Darcy effects due to inertia and boundary. Poulikakos and Renken performed a numerical study of boundary and inertia effects on porous medium flow and heat transfer. Parang and Keyhany analysed mixed convection in an annular region considering boundary and inertia effects. Hooman, quite recently has published numerical works pertaining to this non-linear flow model in porous media. In this paper we report solution of the Darcy-Brinkman-Forchheimer equation for fully developed two-dimensional flows through a channel using the computer assisted homotopy continuation method with 3D animation visualization effects. A rectangular coordinate system is a three-dimensional coordinate system that specifies point positions by the distance from a chosen reference axis, the direction from the axis relative to a chosen reference direction, and the distance from a chosen reference plane perpendicular to the axis. The latter distance is given as a positive or negative number depending on which side of the reference plane faces the point. The origin of the system is the point where all three coordinates can be given as zero. This is the intersection between the reference plane and the axis. The axis is variously called the rectangular axis, to differentiate it from the polar axis, which is the ray that lies in the reference plane, starting at the origin and pointing in the reference direction.

Mathematical formulation for a rectangular channel occupied by a Newtonian liquid

The physical system consists of a highly percolative medium of an infinite horizontal extent bounded by walls impermeable to the liquid. It is assumed that the non – Darcy fully-developed flow in the medium due to constant pressure gradient can be described by the Darcy - Brinkman – Forchheimer (DBF) model

PRODUCTION OF ANIMATION TECHNIQUES

3D animation also called as Computer Graphics or CG. CG refers to any picture or series of pictures that are generated with the aid of a computer. The process of creating in 3D requires that we need to model or shape objects in a scene, give them color and light, animate them as required, and render them through a virtual camera to make an image. The CG animation process has inherited from the film industry a pipeline, or way of doing things, that consist of three broad stages:

1. PRE PRODUCTION
2. PRODUCTION
3. POST PRODUCTION

PRE – PRODUCTION

Pre–production is the process in which the Script and Storyboards are written, gathering all references materials, motion tests, layout drawings, model sketches, and such together to make the actual CG production as straightforward as possible. Costumes and sets are designed and built, actors are cast and rehearsed, a crew is hired and the equipment is rented and setup. The Script is to tell a story we need to put story in words. The script serves as the initial blueprint for the animation. The storyboard is a further definition of the script. We break the script into scenes, and then we break those scenes into shots. Then we sketch out each shot on a panel of a storyboard. The panels are laid out in order according to the script to give a visual and linear explanation of the story. Storyboards are useful for planning camera angles (framing a shot), position of character, lighting, and mood and so on.

PRODUCTION

In production we follow several steps of procedures. Initially its starts from modeling are the process of creating 3D objects. There are many modeling techniques. The choice of which to use usually depends on the modeler's taste and preferred workflow. Maya software uses three types of modeling: polygons, NURBS and subdivision surfaces. Texturing process is applying colors and textures to an object to make it renderable. Animation is a process of giving movement or life to a created object or character. Lighting is an important part of CG. During this step, we set up virtual lights in a scene to illuminate objects and action. Lighting can drastically alter the look of a scene. It greatly affects the believability of models and textures. Rendering is the process of calculating lights and shadows, the placement of textures and colors on models, the movement of animated objects, and so on to give you images that used to create final movie file like AVI, QUICK TIME. Various number of software is available to ease the CG Production work, such as MAYA, MAX, BLENDER, LIGHTWAVE, REAL FLOW, HOUDINE etc.

POST- PRODUCTION

Post production for CG film is similar to film. This is where all of a CG film's elements are brought together and assembled into final form. post production involves Compositing, Editing and Sound. Compositing is the process of bringing together scene elements that were created separately, to form final scene. CG is rendered in different layers and segments and needs to be put back together. In a particular scene, for example, multiple characters interact; each character is rendered separately from the others and from the backgrounds. They all put together in compositing. Various number of compositing software are available in market such as ADOBE AFTER EFFECT, EYE ON FUSION, NUKE etc. The editing is the process of rendered CG footage is collected and edited together to conform to the script and story boards. Some scenes are cut or moved around to heighten the story. This process is same as film editing. Software for editing is ADOBE PRIMEAR, COMBUSTION, etc. The sound is the design of important to CG. Viewers like to associate visuals with audio. A basic soundtrack can add a significant punch to a simple animation by helping provided realism, mood, narrative, and so on. Software used for sound editing is Sony sound frozen. System Requirement for graphics software for these process is Intel xeon, processor, Graphics Card with 1GB memory, 4 GB RAM. True Color Monitor.

HCM code in Mathematica 6.0 version for solving System of non-linear differential equations:

Initialization of the values

$A=Da^2 * \Lambda$, $B=Re*Da^2*\Lambda$

```
A = 1*10*10;
B = 0.05*10*10*1;
Λ = 1;
v0 = α;
v2 =(B α2+A α-Λ)/2;
v4 =(v2/12) (2 B α+A);
v6 =((2 B α+A) v4+ B (v2)^2)/30;
v8 =((2 B α+A) v6+2 B v2 v4)/56;
Solve[α+v2+v4+v6+v8□0,α];
```

Find the values below parameters

A= 100

B= 5

Λ = 1

Find the α

{{α→-19.9957},{α→-19.687},{α→-10.9227},{α→-0.804572},
{α→0.00999271}}

RESULT AND DISCUSSIONS

The results of the present paper indicate that the effect of the Forchheimer number, F on the flow velocity becomes weak for low-percolation media. The velocity decreases with increase in the value of Darcy number for rectangular channel flow, cylindrical tube flow and annular flow through porous media. In case of rectangular channel the plug velocity is seen for all values of Da. This is true of the annulus flow through porous media when *Da.* is large. The profile in the case of small *Da.* is parabolic rather than flattened as in plug flow velocity. The effect of Λ on the flow velocity and shows that there is a decrease in velocity with an increase in the Brinkman number, Λ , as shown by Vafai and Kim and Nield et al.. The boundary effect is captured quite well by the homotopy continuation method for channel, tube and annular flows. We clearly see the effect of non-linear form drag on the velocity. This is represented by the Forchheimer number *F.* The effect of increasing *F* is to decrease the velocity, which is similar to the effect of increasing Darcy number. The excellent results on boundary and inertia effects on flow velocity speak about the utility of the method in capturing detailed flow features. It is important to mention here that the method succeeds in giving the required solution for some parameters' combination when shooting technique, based on Runge-Kutta-Fehlberg45 and modified Newton-Raphson methods, fails for large values of *F*.

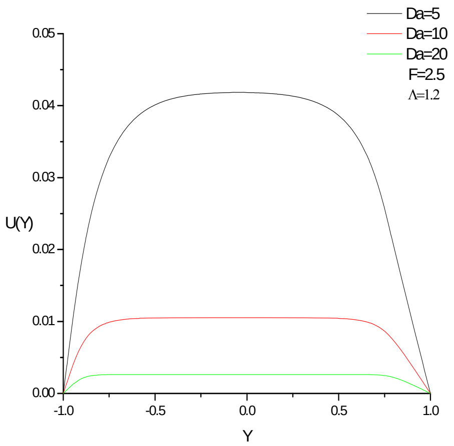

Fig 1

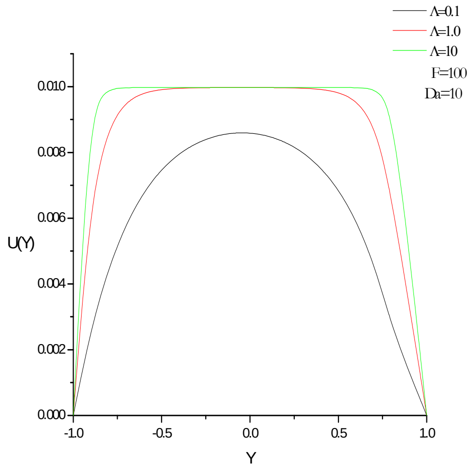

Fig 2

Figures 1 and 2 shows Plot of *U(Y)* vs. *Y* for different values of Da. and Plot of *U(Y)* vs. *Y* for different values of *Λ*.

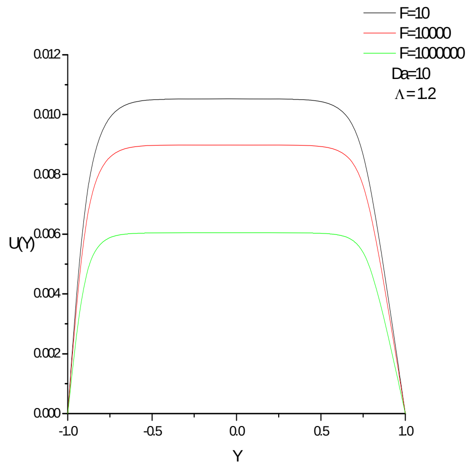

Fig 3: Plot of *U(Y)* vs. *Y* for different values of *F* and fixed values of *Da* and *Λ* for channel flow.

REFERENCE

[1] D. A. Nield and A. Bejan, Convection in porous media, Springer Verlag, New York, 2006.
[2] K. Vafai, Hand book of porous media, CRC Press, 2005.
[3] E. Skjetne and J. L. Auriault, New insights on steady, non-linear flow in porous media, Eur. J. Mech. B/Fluids, 18 (1999) 131-145.
[4] V. V. Calmidi and R. L. Mahajan, Forced convection in high porosity metal foams, ASME J. Heat Trans., 122(3) (2000) 557-565.
[5] John Lasseter, "Principles of Traditional Animation Applied to 3D ComputerAnimation", Computer Graphics,(1987) pp. 35-44.