

Review Form 1.7

Journal Name:	Journal of Advances in Mathematics and Computer Science
Manuscript Number:	Ms_JAMCS_110122
Title of the Manuscript:	COMPARATIVE STUDY OF THE SBA AND MOL METHODS. APPLICATION TO SOME SYSTEMS OF NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS.
Type of the Article	

Review Form 1.7

PART 1: Review Comments

	Reviewer's comment	Author's comment (if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
<p>Compulsory REVISION comments</p> <p>1. Is the manuscript important for scientific community? (Exactly it is important for the scientific community)</p> <p>2. Is the title of the article suitable? (Title of the article is suitable but please avoid the abbreviations in the title)</p> <p>3. Is the abstract of the article comprehensive?</p> <p>4. Are subsections and structure of the manuscript appropriate?</p> <p>5. Do you think the manuscript is scientifically correct?</p> <p>6. Are the references sufficient and recent? If you have suggestion of additional references, please mention in the review form.</p> <p><u>(Apart from above mentioned 6 points, reviewers are free to provide additional suggestions/comments)</u></p>	<p>1. The Abstract should contain answers to the following questions: What problem was studied and why is it important? What methods were used? What are the important results? What conclusions can be drawn from the results? What is the novelty of the work and where does it go beyond previous efforts in the literature? Please include specific and quantitative results in your Abstract, while ensuring that it is suitable for a broad audience. References, figures, equations and abbreviations should be avoided.</p> <p>2. The authors used the concept of Method of Lines (MOL) in the article as a novel technique how it is different from Finite element method.</p> <p>3. What is the physical significance of the Fisher-Murray and Fitz Hugh-Nagumo system what is the motivation behind this to find out its solutions?</p> <p>4. What types of the huddles that you face during the study of MOL and how you reduce what kinds of the parameters used to overcome the huddles.</p> <p>5. Why you compared your results with the SBA method.</p> <p>6. There is no literature on the SBA method please added a separate literature on it</p> <p>7. Paste all Matlab codes in the Appendix section. Of the MOL and SBA method</p>	<p>1. Our Abstract will be: The paper aims at solving two systems of nonlinear partial differential equations , namely the Fisher-Murray and the Fitz Hugh-Nagumo which are two different mathematical models often used to study ecological and biological phenomena. These systems of equations are solved using the numerical Method of lines and the computed solution has to be compared with the ones obtained from Somé Blaise Abbo (SBA) method (combination of Adomian method, Picard and successive approximation) by means of Matlab routines. The results showed the accuracy and the efficiency of two methods.</p> <p>2. The Method of lines uses the finite element method as a spatial discretization technique for transforming partial differential equation to ordinary differential equation .</p> <p>3. The Fisher-Murray system models the propagation of biological limits, the diffusion of a population in an environment. This is derived from a diffusion reaction equation whereas Fitz Hugh-Nagumo model describes neuronal oscillations and excitability . The motivation behind the determination of solution to these systems will lead us to an understanding of the patterns of propagation, developpement and behaviour of population in the case of Fisher-Murray system, as well as for the mode of operation of neuronal oscillations for the Fitz Hugh-Nagumo model. These two models help researchers to predict, understand and control a wide range of natural and biological phenomena .</p> <p>4. To solve the partial differential equation, we want to transform them into an ordinary differential equation . To achieve this, we need to eliminate the space variable by discretization and retain the time variable, thus creating an ordinary differential equation.</p> <p>5. The basic idea is to see the consistency between the analytical Somé Blaise Abbo method and the numerical lines method, and to analyse which of the two methods provides a less costly solution .</p> <p>6. The Somé Blaise Abbo method is an efficient algorithm used by researchers to solve partial differential equations and ordinary differential equations. This method meets the challenges of Adomian polynomial calculations.</p> <p>7. The Matlab codes in the appendix are : <u>-Code MOL Fisher-Murray</u> <u>a/ function</u> yt=Mol112(t,y) N=101; h=pi/(N-1); x=0:h:pi; r=1/h^2; a=1/4; s=a*r; for j=1:N u(j)=y(j); v(j)=y(j+N); end ut(1)=r*(u(2)-2*u(1))+s*(u(2)*u(2))+r*u(1)*(u(2)-2*u(1))+u(1)*u(1)-v(1)*v(1); vt(1)=r*(v(2)-2*v(1)+exp(-t))-s*(v(2)-exp(-t))*(v(2)-exp(-t))+u(1)*u(1); ut(N)=r*(2*u(N-1)-2*u(N)-2*h*exp(-t))+r*u(N)*(2*u(N-1)-2*u(N)-2*h*exp(-t))+u(N)*u(N)-v(N)*v(N)+exp(-2*t); vt(N)=r*(2*v(N-1)-2*v(N))+u(N)*u(N); for j=2:N-1</p>

Review Form 1.7

		<pre> ut(j)=r*(u(j+1)-2*u(j)+u(j-1))+s*(u(j+1)-u(j-1))*(u(j+1)-u(j-1))+r*u(j)*(u(j+1)- 2*u(j)+u(j-1))+u(j)*u(j)-v(j)*v(j)); vt(j)=r*(v(j+1)-2*v(j)+v(j-1))-s*(v(j+1)-v(j-1))*(v(j+1)-v(j-1))+u(j)*u(j); end for j=1:N yt(j)=ut(j); yt(j+N)=vt(j); end yt=yt'; end b/function FISHERMurray clear all clc global ncall u v x n ncase=1; n=101; t0=0.0; h=pi/(n-1); for i=1:n x(i)=(i-1)*h; u(i)=sin(x(i)); v(i)=cos(x(i)); end y0=[u v]; y0=y0'; tf=.1; nout=101; tout=linspace(t0,tf,nout); ncall=0; reltol=1.0e-04;abstol=1.0e-04; options=odeset('RelTol',reltol,'AbsTol',abstol); [t y]=ode15s(@Mol112,tout,y0,options); for it=1:nout for i=1:n u(it,i)=y(i); v(it,i)=y(i+n); end end end figure(1) subplot(1,2,1) plot(x,u,'-k'); axis tight title('u(x,t) vs x,t=0,.05,.1,...,1') xlabel('x');ylabel('u(x,t)') subplot(1,2,2) plot(x,v,'-k'); axis tight title('v(x,t) vs x,t=0,.05,.1,...,1') xlabel('x');ylabel('v(x,t)'); figure(2) surf(u); axis tight xlabel('x grid number'); ylabel('t grid number'); zlabel('u(x,t)'); title('two nonlinear pdes system'); view([-115 36]) </pre>
--	--	--

Review Form 1.7

		<pre>colormap gray figure(3) surf(v) xlabel('x grd number') ylabel('t grid number') zlabel('v(x,t)'); title('Two nonlinear pdse system'); view([170 24]); colormap gray figure(4) SBAFMfig3 title('SBA solution of two nonlinear pdes system'); colormap gray End -Code SBA Fisher-Murray C/function yt=Mol112(t,y) global u v ut vt N x N=101; h=pi/(N-1); x=0:h:pi; r=1/h^2; a=1/4; s=a*r; for j=1:N u(j)=y(j); v(j)=y(j+N); end ut(1)=r*(u(2)-2*u(1))+s*(u(2)*u(2))+r*u(1)*(u(2)-2*u(1))+u(1)*u(1)-v(1)*v(1); vt(1)=r*(v(2)-2*v(1)+exp(-t))-s*(v(2)-exp(-t))*(v(2)-exp(-t))+u(1)*u(1); ut(N)=r*(2*u(N-1)-2*u(N)-2*h*exp(-t))+r*u(N)*(2*u(N-1)-2*u(N)-2*h*exp(-t))+u(N)*u(N)-v(N)*v(N)+exp(-2*t); vt(N)=r*(2*v(N-1)-2*v(N))+u(N)*u(N); for j=2:N-1 ut(j)=r*(u(j+1)-2*u(j)+u(j-1))+s*(u(j+1)-u(j-1))*(u(j+1)-u(j-1))+r*u(j)*(u(j+1)-2*u(j)+u(j-1))+u(j)*u(j)-v(j)*v(j)); vt(j)=r*(v(j+1)-2*v(j)+v(j-1))-s*(v(j+1)-v(j-1))*(v(j+1)-v(j-1))+u(j)*u(j); end for j=1:N yt(j)=ut(j); yt(j+N)=vt(j); end yt=yt'; end Code MOL Fitz Hugh-Nagumo d/ function yt=pdemolFitz(t,y) theta1=.5;theta2=2.5; psi=1.5;n=41; h=pi/(n-1); for i=1:n x(i)=(i-1)*h; end r=psi/(h^2); for i=1:n u(i)=y(i); v(i)=y(i+n); end ut(1)=r*(u(2)-2*u(1))+theta1*exp(abs(1-psi)*t))+2*u(1)+v(1);</pre>
--	--	--

Review Form 1.7

		<pre>ut(n)=r*(2*u(n-1)-2*u(n)-2*theta2*h*exp(abs(1-psi)*t))+2*u(n)+v(n); vt(1)=r*(v(2)-2*v(1)+theta1*exp(abs(1-psi)*t))+v(1)+u(1)*v(1)+v(1)*v(1); vt(n)=r*(2*v(n-1)-2*v(n)+2*theta2*exp(abs(1-psi)*t))+v(n)+u(n)*v(n)+v(n)*v(n); for i=2:n-1 ut(i)=r*(u(i+1)-2*u(i)+u(i-1))+2*u(i)+v(i); vt(i)=r*(v(i+1)-2*v(i)+v(i-1))+v(i)+u(i)*v(i)+v(i)*v(i); end for i=1:n yt(i)=ut(i); yt(i+n)=vt(i); end yt=yt'; e/ function FITZNagamou clear all clc theta1=.05;theta2=1.5; psi=0.5; ncase=1; %initial conditions n=41; t0=0.0; h=pi/(n-1); for i=1:n x(i)=(i-1)*h; u(i)=theta1*cos(x(i))+theta2*sin(x(i)); v(i)=-u(i); y0(i)=u(i); y0(i+n)=v(i); end y0=[u v]; y0=y0'; tf=20; nout=21; tout=linspace(t0,tf,nout); ncall=0; %ode integration reitol=1.0e-04;abstol=1.0e-04; options=odeset('RelTol',reitol,'AbsTol',abstol); [t,y]=ode15s(@pdemolFitz,tout,y0,options); for it=1:nout for i=1:n u(it,i)=y(i); v(it,i)=y(i+n); end end figure(1) subplot(1,2,1) plot(x,u,'-k'); axis tight title('u(x,t) vs x,t=t=0,.05,.1,...,1') xlabel('x');ylabel('u(x,t)') subplot(1,2,2) plot(x,v,'-k');axis tight title('v(x,t) vs x, t=0,.05,.1,...,1') xlabel('x');ylabel('v(x,t)'); figure(2)</pre>
--	--	---

Review Form 1.7

		<pre>surf(u); axis tight xlabel('x grid number'); ylabel('t grid number'); zlabel('u(x,t)'); title('two nonlinear pdes system'); view([-115 36]) colormap gray figure(3) surf(v); axis tight xlabel('x grd number') ylabel('t grid number') zlabel('v(x,t)'); title('Two nonlinear pdse system'); view([170 24]); colormap gray SBAfig2 title('SBA solution of two nonlinear pdes system'); view([-115 36]); %view(2); colormap gray end f/ function SBAfig2 theta1=.05;theta2=1.5; psi=0.5; n=41; h=pi/(n-1); x=0:h:pi; t=0:.01:.5; [X,T]=meshgrid(x,t); U=(theta1*cos(X)+theta2*sin(X)).*exp(abs(1-psi)*T); V=-U; figure(5) surf(U); axis tight xlabel('x grd number') ylabel('t grid number') zlabel('u(x,t)'); title(' SBA solution of two nonlinear pdse system'); view([170 24]); colormap gray figure(6) surf(V);axis tight; xlabel('x grd number') ylabel('t grid number') zlabel('v(x,t)'); title('SBA solution of two nonlinear pdes'); view([170 24]); colormap gray; end</pre>
--	--	--

Review Form 1.7

Minor REVISION comments		
1. Is language/English quality of the article suitable for scholarly communications?	Major revision	
Optional/General comments		

PART 2:

	Reviewer's comment	Author's comment (if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
Are there ethical issues in this manuscript?	(If yes, Kindly please write down the ethical issues here in details)	There are not ethical issues in this manuscript