ELEN 530: Advanced Computer Applications for Engineers
Dynamic Systems and Process Change Over Time(MATLAB Code)

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x(1) = 0.25; r = 2.0; f=@(x) r*x*(1-x);
N = 80;
for ii = 1:N x(ii+1) = r*x(ii)*(1-x(ii)); hold on; end
plot(x,'r') axis([0 80 0 1]) title('Logistic Map: Timestamps for when r = 2')

x(1) = 0.25; r = 3.1; f=@(x) r*x*(1-x);
N = 80;
for ii = 1:N x(ii+1) = r*x(ii)*(1-x(ii)); hold on; end
figure
plot(x,'r') axis([0 80 0 1]) title('Logistic Map: Timestamps for when r = 3.1')


x(1) = 0.25; r = 3.5; f=@(x) r*x*(1-x);
N = 80;
for ii = 1:N x(ii+1) = r*x(ii)*(1-x(ii)); hold on; end
figure
plot(x,'r') axis([0 80 0 1]) title('Logistic Map: Timestamps for when r = 3.5')


x(1) = 0.25; r = 3.65; f=@(x) r*x*(1-x);
N = 80;
for ii = 1:N x(ii+1) = r*x(ii)*(1-x(ii)); hold on; end
figure
plot(x,'r') axis([0 80 0 1]) title('Logistic Map: Timestamps for when r = 3.65')


x(1) = 0.25; r = 3.84; f=@(x) r*x*(1-x);
N = 80;
for ii = 1:N x(ii+1) = r*x(ii)*(1-x(ii)); hold on; end
figure
plot(x,'r') axis([0 80 0 1]) title('Logistic Map: Timestamps for when r = 3.84')


x(1) = 0.25; r = 3.95; f=@(x) r*x*(1-x);
N = 80;
for ii = 1:N x(ii+1) = r*x(ii)*(1-x(ii)); hold on; end figure
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    plot(x,'r') axis([0 80 0 1]) title('Logistic Map: Timestamps for when r =
3.95')
    n = (0:0.01:1) x = 0.5 a = 2.*n.*(1-n) b = 3.1.*n.*(1-n) c = 3.5.*n.*(1-n) d
= 3.65.*n.*(1-n) e = 3.84.*n.*(1-n) f = 3.95.*n.*(1-n) plot(n,a,'r',n,b,'g',n,c,'b',n,d,'m',n,e,'y',n,f,'c')
legend('r=2.0', 'r=3.1','r=3.65','r = 3.84', 'r=3.95') xlabel('x', 'fontsize',18,'fontname',
'times') ylabel('f(x) as a Function x', 'fontsize',18,'fontname','times') title(
'Limted Growth Model Logistic Map: (f(x) vs. x)')
    clear scale = 10000; maxpoints = 200; N = 3000; a = 1.0; b = 4; rs =
linspace(a,b,N); M = 500;

for j = 1:length(rs)
r=rs(j); x=zeros(M,1); x(1) = 0.5;
for i = 2:M, x(i) = r*x(i-1)*(1-x(i-1)); end
outj = unique(ro und(scale*x(end-maxp oints:end))); end
data = []; for k = 1:length(rs) n = length(outk); data = [data; rs(k)*ones(n,1),outk];
end
    figure h=plot(data(:,1),data(:,2)/scale,'k.'); set(h,'mar kersize',1) axis tight
set(gca, 'xlim', [1.0 4.0]); set(gcf,'color','white') axis on title( 'Bicurati on Di-
agram of the Logistic Map: (x vs. r)')
    clear scale = 10000; maxp oints = 50; N = 30; a = 2.91; b = 3.005; rs =
linspace(a,b,N); M = 500;
for j = 1:length(rs)
r=rs(j); x=zeros(M,1); x(1) = 0.5;
for i = 2:M, x(i) = r*x(i-1)*(1-x(i-1)); end
outj = unique(r ound(scale*x(end-maxp oints:end))); end
data = []; for k = 1:length(rs) n = length(outk); data = [data; rs(k)*ones(n,1),outk];
end
    figure h=plot(data(:,1),data(:,2)/scale,'k.'); set(h,'ma rkersize',1) axis tight
set(gca, 'xlim', [2.98 3.01]); set(gcf,'color','white') axis on title( 'Bicuration
Diagram of the Logistic Map: (x vs. r)')
    clear scale = 10000; maxp oints = 400; N = 30; a = 3.41 b = 3.465; rs =
linspace(a,b,N); M = 500;
for j = 1:length(rs)
r=rs(j); x=zeros(M,1); x(1) = 0.5;
for i = 2:M, x(i) = r*x(i-1)*(1-x(i-1)); end
outj = unique(round(scale*x(end-maxpoints:end))); end
data = []; for k = 1:length(rs) n = length(outk); data = [data; rs(k)*ones(n,1),outk];
end
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figure h=plot(data(:,1),data(:,2)/scale,'k.'); set(h,'mar kersize',1) axis tight set(gca, 'xlim', [3.4 3.5]); set(gcf,'color','white') axis on