Collected Papers of Lord Soumadeep Ghosh

Volume 33

The shadow rate, the bloom rate and the associated theorems

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the shadow rate, the bloom rate and the associated theorems.
The paper ends with "The End"

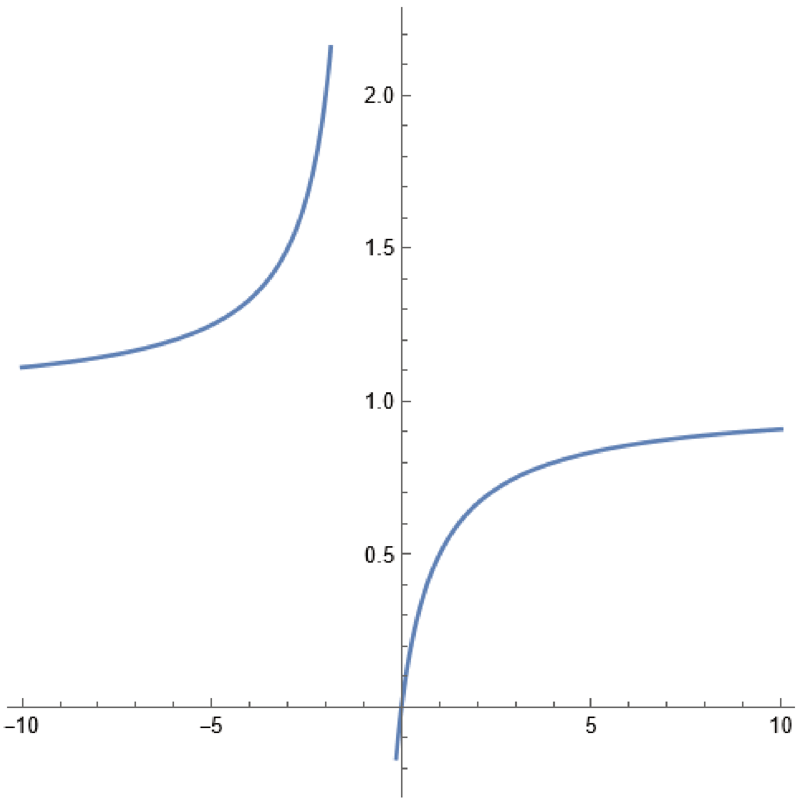
Introduction

Whenever there exists a rate r, risk-free or otherwise, there also exists a **shadow rate** and a **bloom rate**. In this paper, I describe the shadow rate, the bloom rate and the associated theorems.

The shadow rate

The shadow rate for a rate r is

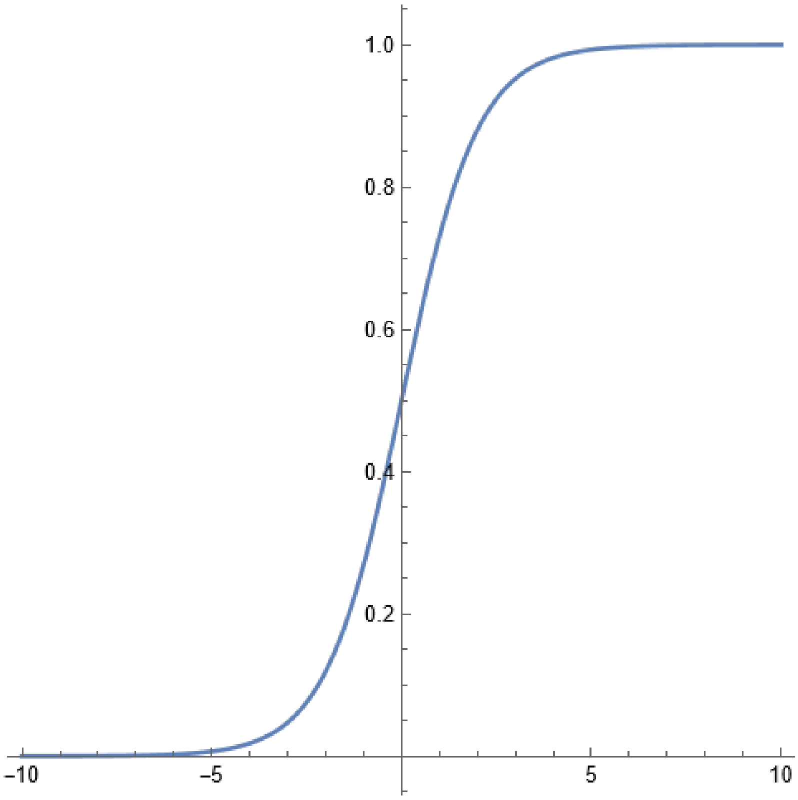
$$r_s(r) = \frac{r}{1+r}$$



The bloom rate

The bloom rate for a rate r is

$$r_b(r) = \frac{e^r}{1+e^r}$$



The fundamental theorem of shadow rates and bloom rates

There is no real r such that

$$r_s(r) = r_b(r)$$

The second theorem of shadow rates and bloom rates

There are at least 14 complex r such that

$$r_s(r) = r_b(r)$$

The third theorem of shadow rates and bloom rates

There is only 1 real $r = -W(\frac{1}{e}) - 1$ such that

$$r_s(r)r_b(r) = 1$$

where
$W(z)$ gives the principal solution w for $z = we^w$

The fourth theorem of shadow rates and bloom rates

There is only 1 real $r = -0.7581185...$ such that

$$r_s(r)r_b(r) = -1$$

The End

Ghosh's wine glass curve

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe my wine glass curve.
The paper ends with "The End"

Introduction

In this paper, I describe my wine glass curve.

My wine glass curve

My wine glass curve with parameters r and s is the union of the two curves

C1:

$$x^2\left(x^2+r^2\right)^2 = s^2y^2$$

where

$$-(r+s) \leq x \leq (r+s)$$

$$-(r+s) \leq y \leq (r+s)$$

and

C2:

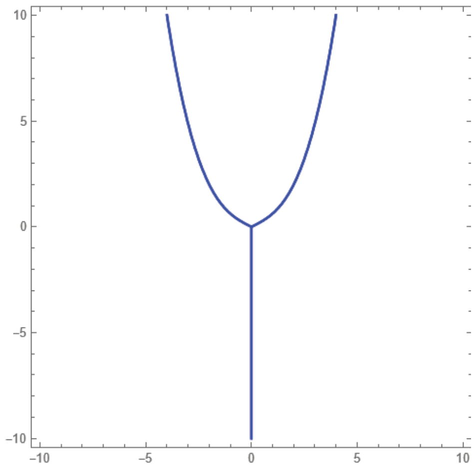
$$x = 0$$

where

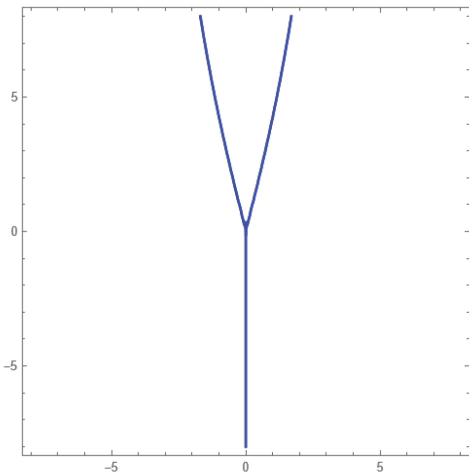
$$-(r+s) \leq x \leq (r+s)$$

$$-(r+s) \leq y \leq 0$$

Plot of my wine glass curve for r = 2 and s = 8



Plot of my wine glass curve for r = 4 and s = 4



The End

The maximal and minimal rates

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the maximal rate and the minimal rate.
The paper ends with "The End"

Introduction

Whenever there are two rates and respective risk-free rates, there also exists a maximal rate and a minimal rate between those four rates.
In this paper, I describe the maximal rate and the minimal rate.

The maximal rate

The **B-biased** maximal rate between two rates $r_B \geq r_A$ and the respective risk-free rates r_{f_B} and r_{f_A} is

$$r_{max B} = max(r_B - r_A, 0, r_B - r_{f_B}, r_B - r_{f_A})$$

The **A-biased** maximal rate between two rates $r_B \geq r_A$ and the respective risk-free rates r_{f_B} and r_{f_A} is

$$r_{max A} = max(0, r_A - r_B, r_A - r_{f_A}, r_A - r_{f_B})$$

The maximal rate between two rates $r_B \geq r_A$ and the respective risk-free rates r_{f_B} and r_{f_A} is

$$r_{max} = max(r_{max B}, r_{max A})$$

The minimal rate

The **B-biased** minimal rate between two rates $r_B \geq r_A$ and the respective risk-free rates r_{f_B} and r_{f_A} is

$$r_{min B} = min(r_B - r_A, 0, r_B - r_{f_A}, r_B - r_{f_B})$$

The **A-biased** minimal rate between two rates $r_B \geq r_A$ and the respective risk-free rates r_{f_B} and r_{f_A} is

$$r_{min A} = min(0, r_A - r_B, r_A - r_{f_A}, r_A - r_{f_B})$$

The minimal rate between two rates $r_B \geq r_A$ and the respective risk-free rates r_{f_B} and r_{f_A} is

$$r_{min} = min(r_{min B}, r_{min A})$$

The End

Ghosh's monic quintic identity

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe my monic quintic identity.
The paper ends with "The End"

Introduction

The monic quintic satisfies many identities, one of which is **my monic identity**.
In this paper, I describe my monic quintic identity.

Ghosh's monic quintic identity

When

$$b - aP + P^2 - Q \neq 0$$

Ghosh's monic quintic identity is

$$x^5 + ax^4 + bx^3 + \left(P^3 + bP + a\left(Q - P^2\right) - 2PQ + \frac{e}{b - aP + P^2 - Q}\right)x^2 + \left(Q\left(b - aP + P^2 - Q\right) + \frac{e(a-P)}{b - aP + P^2 - Q}\right)x + e$$
$$=$$
$$\left(x^3 + Px^2 + Qx + \frac{e}{b - aP + P^2 - Q}\right)\left(x^2 + (a-P)x + \left(b - aP + P^2 - Q\right)\right)$$

The End

Ghosh's monic quintic equation has roots expressible in radicals

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the roots of my monic quintic equation, which are expressible in radicals. The paper ends with "The End"

Introduction

In a previous paper, I've described my monic quintic. In this paper, I describe the roots of my monic quintic equation which are expressible in radicals.

Ghosh's monic quintic equation has roots expressible in radicals

When

$$b - aP + P^2 - Q \neq 0$$

by the right side of Ghosh's monic quintic identity,

Ghosh's monic quintic equation

$$\left(x^3 + Px^2 + Qx + \frac{e}{b - aP + P^2 - Q}\right)\left(x^2 + (a - P)x + \left(b - aP + P^2 - Q\right)\right) = 0$$

can be written as the product of a cubic equation and a quadratic equation, both of which can be solved.

The roots of Ghosh's monic quintic equation are

$$x_1 = \frac{1}{2}\left(-a + P - \sqrt{a^2 + 2aP - 4b - 3P^2 + 4Q}\right)$$

$$x_2 = \frac{1}{2}\left(-a + P + \sqrt{a^2 + 2aP - 4b - 3P^2 + 4Q}\right)$$

$$x_3 = \frac{\sqrt[3]{-\frac{27e}{-aP+b+P^2-Q} + \sqrt{\left(-\frac{27e}{-aP+b+P^2-Q} - 2P^3 + 9PQ\right)^2 + 4\left(3Q-P^2\right)^3} - 2P^3 + 9PQ}}{3\sqrt[3]{2}} - \frac{\sqrt[3]{2}\left(3Q-P^2\right)}{3\sqrt[3]{-\frac{27e}{-aP+b+P^2-Q} + \sqrt{\left(-\frac{27e}{-aP+b+P^2-Q} - 2P^3 + 9PQ\right)^2 + 4\left(3Q-P^2\right)^3} - 2P^3 + 9PQ}} - \frac{P}{3}$$

$$x_4 = -\frac{\left(1-i\sqrt{3}\right)\sqrt[3]{-\frac{27e}{-aP+b+P^2-Q} + \sqrt{\left(-\frac{27e}{-aP+b+P^2-Q} - 2P^3 + 9PQ\right)^2 + 4\left(3Q-P^2\right)^3} - 2P^3 + 9PQ}}{6\sqrt[3]{2}} + \frac{\left(1+i\sqrt{3}\right)\left(3Q-P^2\right)}{3\ 2^{2/3}\sqrt[3]{-\frac{27e}{-aP+b+P^2-Q} + \sqrt{\left(-\frac{27e}{-aP+b+P^2-Q} - 2P^3 + 9PQ\right)^2 + 4\left(3Q-P^2\right)^3} - 2P^3 + 9PQ}} - \frac{P}{3}$$

$$x_5 = -\frac{\left(1+i\sqrt{3}\right)\sqrt[3]{-\frac{27e}{-aP+b+P^2-Q} + \sqrt{\left(-\frac{27e}{-aP+b+P^2-Q} - 2P^3 + 9PQ\right)^2 + 4\left(3Q-P^2\right)^3} - 2P^3 + 9PQ}}{6\sqrt[3]{2}} + \frac{\left(1-i\sqrt{3}\right)\left(3Q-P^2\right)}{3\ 2^{2/3}\sqrt[3]{-\frac{27e}{-aP+b+P^2-Q} + \sqrt{\left(-\frac{27e}{-aP+b+P^2-Q} - 2P^3 + 9PQ\right)^2 + 4\left(3Q-P^2\right)^3} - 2P^3 + 9PQ}} - \frac{P}{3}$$

The End

The roots of the general quintic equation

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the roots of the general quintic equation.
The paper ends with "The End"

Introduction

In a previous paper, I've described the roots to the general cubic equation. In a previous paper, I've described one of the roots of the quartic equation. In a previous paper, I've described my monic quintic identity. In a previous paper, I've described the roots of my monic quintic equation, which are expressible in radicals. In this paper, I describe the roots of the general quintic equation.

Preliminaries

The general quintic equation is

$$ax^5 + bx^4 + cx^3 + dx^2 + ex + f = 0$$

where a, b, c, d, e, f are constants.

If $f = 0$ then the equation reduces to

$$x(ax^4 + bx^3 + cx^2 + dx + e) = 0$$

which has the root $x = 0$ and the quartic

$$ax^4 + bx^3 + cx^2 + dx + e = 0$$

one of whose roots is known and can be factored out. The roots of the remaining cubic are known.

Similarly, if $a = 0$ then the equation reduces to the quartic equation

$$bx^4 + cx^3 + dx^2 + ex + f = 0$$

one of whose roots is known and can be factored out. The roots of the remaining cubic are known.

If $a = f = 0$ then the equation reduces to

$$x(bx^3 + cx^2 + dx + e) = 0$$

which has the root $x = 0$ and the cubic

$$bx^3 + cx^2 + dx + e = 0$$

whose roots are known.

Therefore, $a \neq 0$ and $f \neq 0$ henceforth. Moreover, we divide the general quintic equation by the leading coefficient a to transform the general quintic equation to the monic quintic equation

$$x^5 + ax^4 + bx^3 + cx^2 + dx + e = 0$$

where $e \neq 0$ henceforth.

Comparing coefficients with my monic quintic

Recall that my monic quintic is

$$x^5+ax^4+bx^3+\left(P^3+bP+a\left(Q-P^2\right)-2PQ+\frac{e}{b-aP+P^2-Q}\right)x^2+\left(Q\left(b-aP+P^2-Q\right)+\frac{e(a-P)}{b-aP+P^2-Q}\right)x+e=0$$

Comparing coefficients we get
(1) $a=a$
(2) $b=b$
(3) $c=P^3+bP+a\left(Q-P^2\right)-2PQ+\frac{e}{b-aP+P^2-Q}$
(4) $d=Q\left(b-aP+P^2-Q\right)+\frac{e(a-P)}{b-aP+P^2-Q}$
(5) $e=e$
Thus, if suitable P and Q are obtained, then, by my monic quintic identity, we can reduce the monic quintic equation to the product of a cubic equation and a quadratic equation, whose roots are known.

Choosing P and Q

Eliminating e between equations (3) and (4) gives us the eliminant

$$(6)\ a^2P^2-a^2Q-abP+ac-2aP^3+2aPQ+bP^2+bQ-cP-d+P^4-P^2Q-Q^2=0$$

As long as $b-aP+P^2-Q\neq 0$ and we obtain corresponding P and Q, we may choose any value for either P or Q to solve the eliminant. For most quintics, $P=0$ is a valid and convenient choice. When $P=0$ is not a valid choice, other valid and convenient choices may be $P=a$, $Q=0$, $Q=P^2$ etc.

Solving the monic quintic

Once we have at least one valid value of P and one valid value of Q, by the right side of my monic quintic identity, we obtain 5 roots of the monic quintic equation.

Notes

1. Note that by following this procedure, we obtain 5 roots of the general quintic equation expressible in radicals.
2. Note that this procedure doesn't invalidate Galois' theory since our procedure is based on expressing the general quintic equation as **factored forms** but not on solving the quintic equation algebraically.

Exercises for the reader

Find the roots of the following quintic equations expressible in radicals:

1. $$x^5+x^4-266713x^3+4x^2-16244256x-31481=0$$
2. $$x^5-x-20=0$$

The End

Prediction and recall of defaults of the United States of America using a neural network

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe how to predict and recall defaults of the United States of America using a neural network.

Introduction

According to the Globalist, the United States of America has defaulted at least four times in the past.

In this paper, we leverage this information to predict and recall defaults of the United States of America using a neural network.

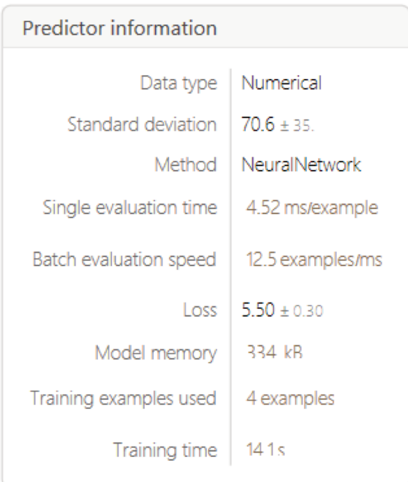
Prediction and recall of defaults of the United States of America using a neural network

We run the following code on **Wolfram Mathematica** to obtain a PredictorFunction object:

```
p = Predict[1 -> 1790, 2 -> 1861, 3 -> 1933, 4 -> 1979, Method -> "NeuralNetwork"];
```

Next, we run the following code to obtain a PredictorInformation object:

```
Information[p]
```



Predictor information

Data type	Numerical
Standard deviation	70.6 ± 35.
Method	NeuralNetwork
Single evaluation time	4.52 ms/example
Batch evaluation speed	12.5 examples/ms
Loss	5.50 ± 0.30
Model memory	334 kB
Training examples used	4 examples
Training time	14.1 s

Finally, we run the following code to predict and recall defaults of the United States of America rounded to the nearest year:

```
Sort[Round[p[Table[i, {i, 5, 100, 1}]]]]
```

The sorted output gives 96 more instances of defaults of the United States of America:

1125, 1133, 1141, 1149, 1157, 1164, 1172, 1180, 1188, 1196, 1204, 1212, 1220, 1228, 1236, 1244, 1252, 1260, 1268, 1277, 1285, 1293, 1301, 1309, 1317, 1325, 1333, 1342, 1350, 1358, 1366, 1375, 1383, 1391, 1400, 1408, 1417, 1425, 1434, 1443, 1452, 1461, 1469, 1478, 1488, 1497, 1506, 1515, 1525, 1534, 1544, 1554, 1564, 1574, 1585, 1596, 1606, 1617, 1628, 1639, 1650, 1662, 1673, 1685, 1698, 1710, 1723, 1736, 1749, 1762, 1774, 1786, 1799, 1811, 1822, 1834, 1845, 1857, 1870, 1882, 1895, 1907, 1919, 1931, 1942, 1953, 1963, 1973, 1981, 1988, 1995, 1997, 2003, 2011, 2014, 2014

The End

Deriving the map of Palestine

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe how to derive the map of Palestine.
The paper ends with "The End"

Introduction

Contrary to popular belief, economic data and mathematics can be used to derive the map of Palestine. In this paper, I describe how to derive the map of Palestine.

Economic data

We use two series of economic data:

1. AJIP: The yearly time-series of Authorized Jewish Immigration to Palestine
2. INDPRO: The yearly time-series of USA Industrial Production Total Index with Year 2017 as 100

Deriving the map of Palestine

First, we calculate the rates of AJIP and INDPRO:

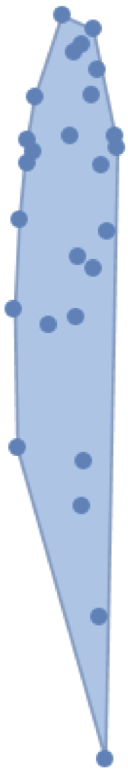
$$r_{AJIP}(t) = \frac{AJIP(t)}{AJIP(t-1)} - 1$$

$$r_{INDPRO}(t) = \frac{INDPRO(t)}{INDPRO(t-1)} - 1$$

Second, we derive a set of 2-D points:

$$P(t) = (r_{AJIP}(t), r_{INDPRO}(t))$$

Third, we rotate the set of 2-D points $P(t)$ by $\deg 90$ counter-clockwise to match geographic orientation.
Fourth, we compute the scatterplot and the convex hull mesh of $P(t)$.
Finally, we overlay the scatterplot and the convex hull mesh to derive the map of Palestine.



Code

Mathematica code used to derive the map of Palestine above is available upon request.

The End

Ghosh's spatio-temporal money function

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe my spatio-temporal money function.
The paper ends with "The End"

Introduction

In a previous paper, I've described two simple models of monetary expansion.
Reaching general equilibrium in an economy eventually requires a spatio-temporal money function.
In this paper, I describe my spatio-temporal money function.

My spatio-temporal money function

For two tuples of space-time co-ordinates (X, Y, Z, T) and (x, y, z, t), my spatio-temporal money function is

$$m(X,Y,Z,T,x,y,z,t) = \frac{\left(2Tt - 2Xx - 2Yy - 2Zz + X^2 + Y^2 + Z^2 - T^2\right)\sqrt{(X-x)^2 + (Y-y)^2 + (Z-z)^2 - (T-t)^2}}{T^2 - X^2 - Y^2 - Z^2}$$

The End

How did Narendra Damodardas Modi and Ahmed Shah loot India?

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe how Narendra Damodardas Modi and Ahmed Shah looted India.
The paper ends with "The End"

Introduction

In a previous paper, I've described the modified option with Narendra Damodardas Modi's TREASON as the underlying.

In this paper, I describe how Narendra Damodardas Modi and Ahmed Shah looted India.

Painting quite the picture

Suppose a small-time trader and his smaller-time "friend" hatched a **plan** to loot India a long time ago.

The small-time trader owns a **perpetual put** on the Indian currency courtesy of the so-called "Reserve Bank of India".

His friend pays a negligible sum of money M_{AS} to appear on television as the "Home Minister of India".

The small-time trader buys a box for cost C and sells at price P for a profit p.

Then

$$P - C = p$$

Now suppose that the payment was done in currency notes of denomination 1000 and 500 issued by the so-called "Reserve Bank of India" and guaranteed by the so-called "Government of India".

Then

$$p = 1000m + 500n$$

for various non-negative integers p, m and n.

Now suppose N such boxes were sold each by a total of T such small-time traders.

Then

$$TN(P - C) = TN(1000m + 500n)$$

for various non-negative m and n

Now suppose each of those boxes are priced in the global market by S foreign credit default swaps each of value V.

Then

$$TN(P - C) = TN(1000m + 500n) = TNSV$$

Now suppose one of the small-time traders pays a negligible sum of money M_{NDM} to appear on television as the so-called "Prime Minister of India" and declare that $INR1000$ and $INR500$ currency notes are not legal tender.

Within a few hours, **contagion** spreads across all denominations of INR currencies in India due to uncertainty and risk caused by the "Prime Minister's Announcement".

The "Prime Minister" who owns the perpetual put makes a lot of money. The "Home Minister" gets to "corral" everybody affected around the sentiment of "Nationalism" and "eliminate" all their domestic (and perhaps international) political opponents.

Just how much did Narendra Damodardas Modi and Ahmed Shah loot from India?

This question is left to be answered by the investigators by interrogation of both Narendra Damodardas Modi and Ahmed Shah.

The End

The ultimate truth of psychiatry

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the ultimate truth of psychiatry.
The paper ends with "The End"

Introduction

Many psychiatrists spend most of their lives trying to find the ultimate secret of psychiatry. In this paper, I describe the ultimate truth of psychiatry.

The ultimate truth of psychiatry

The ultimate truth of psychiatry is

"There is no such thing called mental illness per se. There are only those who either think or are perhaps made to think that they are mentally ill."

The End

A design of a war room

Soumadeep Ghosh

Kolkata, India

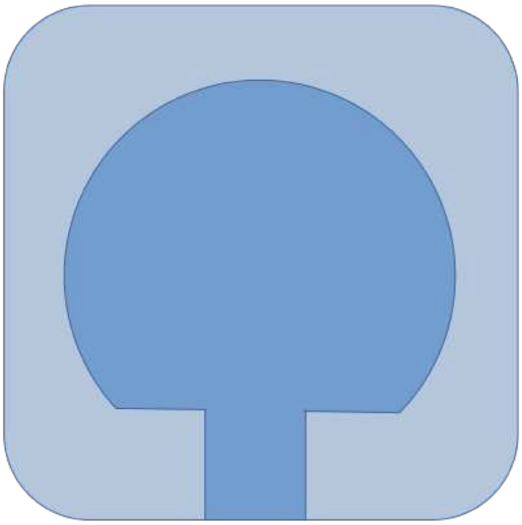
Abstract

In this paper, I describe a design of a war room.
The paper ends with "The End"

Introduction

The **war room** is the ultimate location of concentrated power: militaric, economic and geopolitical.
In this paper, I describe a design of a war room.

A design of a war room



The End