Satellite-Mapping, Trigonometry, Geophysics, and Philosophy of Kudargarh Mountain in Surajpur District CG India.

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Abstract: Kudargarh is a sanctum mountain being Kudargarh Festival in Surajpur District in Chhattisgarh state in India. The shape of Kudargarh Mountain from a satellite map looks like a Lion. It GPS position, at North East border is 23.6409800N, 82.795478E and at South West border is 23.6463222N; 82.678187E. An exploration of Kudargarh Mountain was done to study geophysical parameters using satellite imaginary topography, the mathematical law of trigonometry, and geometry. Contour mapping and satellite imagery were also observed to calculate the height, mountain area, and the philosophy behind Kudargarh Fare.

Key words: Kudargarh Mountain, Kudargarh Temple, Kudargarh Festival, Surajpur Tourism, Bagheshwaree Temple, Kudargarh Montology.

INTRODUCTION: There is a beautiful scenario of the earth, at about every 50Km, there is presence of river, rivulet, mountain, hill, hillock, uplands and ponds. The mountains and rivers are associated with their own ethics and have a history with human society. Mathematics in geography is dependent on traditional mapping takes a general knowledge of geometry, especially Trigonometry, and some field methods rely on heavy use of statistical methods. [1] Heron in 1751, measured height of a wall and mountain, when its distance from the observer is known. Heron’s process of measuring the distance from base to an unapproachable peak point B, where the distance measured by rods and the distance A B is calculated by similar trigonometry. [2] The geodetic determination of mountains height, since the time of the inauguration of improved procedure, was made by the Franciscan Father Louis Feuillée in 1724. With a chain of 18.2m feet, he measured a base line pointing toward the center of the mountain, and did found 409.3 m. [3]

Author visited Lyon city for conference participation MS’04 in France. To the west of Lyon city there is a Hill Fourvière, known as “the hill that prays”. A funicular (a railway on about 450 to 500 steep hill) made for prayer in famous church. To the north; there is the Croix-Rousse, known as “the hill that works”[4,5]. In India too. Mountains and Rivers are praised festivals, Like Ramgarh Festival, Khudiaryani Festival, Narmada Festival, Ganga Dasahara etc. [6-12]

Kudargarh Mountain has geographical importance in Surajpur District in CG, India. But its height was not yet measured. Objective of the paper is to measure the height of Kudargarh by ground observation, trigonometric calculation and satellite contour map reading along with altitude readings with an altimeter.

METHODOLOGY: At first, we down loaded Slope meter, Altimeter, GPS imaginary map, and Contour line map applications in Android phone. [13-15] Exploration started from Ambikapur, Chhattisgarh, GPS coordinates of 23° 6’ 59.1984” N and 83° 11’ 46.0356” E. on west side NH 43 crossing Pilkha Hill southward and crossing, Bishrampur city, Renu river bridge, reached Surajpur run 40 Km. Then turned right, North side on Major District Road-7 (MRD7) Bhaiyathan Road, crossing Gobari River Bridge reached Kudargar running more 44km. Figure 1 represents the gate to hike on Kudargarh Mountain, and figures 2 to 6 represent various Places on hiking the Mountain GPS positions, altitude. Observation, measurement, photography and video graphs were frequently recorded and were saved. Exploration was done by foot walking to hike approximately 860 steps..Height measurement has been done by following methods:

Satellite-Mapping: Figures 1a, 2 and 3 represent google maps physical Topographic and Satellite Views, Figure 4 represents Contour map of Kudargarh Mountain (KM). Basics of mapping is that north is always at the top of a topographic map. Right side is east and left side is west. Topographic maps produced by Natural Resources Canada (NRCan) offer detailed information on a particular area. the basics of topographic map is topographic map is at the scale of 1:50 000. Using a compass along with a topographic map ensures obtaining an exact direction for locating features.

A Height by Contour map:
Contour line of the points of same elevation. In figure 4 It is observed that:
Top read altimeter=650m.
Lowest contour line’s reading= 450m
Thus the heights of KM = 650m - 450 = 200m.

But in the figure, top contour lines and bottom contour lines are not read. Therefore it should be added + 25m top +.25m bottom. In this way Height (H) of temple ≈ 250 meter.

**B Height measurement by Steps on stair:** There is a stair of 850 steps having average height of 25 cm. at the average, i.e. 800 steps up to temple, plus equality of about 50 steps height to reach the top (peak) of the Kudargarh Mountain (Ruin fort of King Balam).

Therefore, Total height = 850 x 25 = 21250 Cm = 212.5m.

**C. By Trigonometry:** Figure 1 represents a outline of a mountain and its trigonometric simulation ABC is triangle in which AC = a (Base), AB = b (Perpendicular / height) and BC = c (Hypotenuse = Stair).

![Figure 1 Outline of Mountain in Triangle Simulation](image)

Trigonometric calculation of height of Kudargarh Mountain:

Following the theorem of "Pythagoras of Samos" [16]

\[
A^2 + B^2 = C^2 \quad \text{Or} \quad B^2 = C^2 - A^2 \quad \text{Eq1}
\]

**BASE:** Map measurements are stated not only in degrees but also in minutes and seconds. Each degree can be broken into 60 minutes, and each minute can be divided into 60 seconds. Any given location can be described in terms of degrees, minutes, and seconds of longitude and latitude.

1° = 111 km = 111000m.

1' = 111000/60 = 1850m.

1" = 1850/ 60 = 30.83m

GPS position, at North East border is 23.6409800 82.795478E and at South West boarder is 23.6463222 N; 82.678187E. The difference of longitude = 0.0053422N. The difference of latitude = 0.12'13"E Earth.

Here 12' = 12 x 1850 = 22200m and 13' = 13 x 30.8 = 414m.

Total 22200 + 414 = 22644 m, Diameter. And 11322m will be the radius from East- west expansion of mountain.

Just like this, in the North-South direction the difference of longitudes is 0.0053422N, it could be considered as 54", therefore, 54x 30.8 = 1663.2m is expansion of the Mountain. Thus its half will be the base distance of Triangle ABC.

**HYPOTENUSE:** Angle of the angle reading 30° and Downed to 10° to reach the temple. Thus average angle of Hiking mountain (Sine theta)=20°. Although then there is to hike further to reach the peak of K Mountain.

Up to distance of 2.00 km. = 2250m.

Putting the Values in Equation 1

\[
B^2 = (2000)^2 - (1663)^2 = 1234431
\]

\[
B = \sqrt{1234431} = 1,111m = 111Km.
\]

**D. HEIGHT MEASURE USING ANGLE THETA:** In a triangular ABC,

\[
\text{Sine } \alpha = \text{ Perpendicular / Hypotenuse}
\]

\[
\text{Perpendicular} = \text{Hypotenuse x Sine } \alpha
\]

Here, Sine 20° = 0.342 (From Rapid Calculator.com)

So perpendicular = 2000 x 0.342 = 684m.

\[
\text{Tan } \alpha = \text{ Perpendicular / Base}
\]

\[
\text{Perpendicular (Height) = Base x Tan } \alpha.
\]

We have average angle of Hiking 20° and Tan 20° = 0.3640 (From Rapid Calculator.com)

\[
\text{Perpendicular (Height) = 1663 x 0.3640 = 605 m.}
\]

Average Height Using Angle theta = 684+605/2 =1289/2 = 645m

**GEOPHYSICS:** GPS coordination cane help to find out base length (2a) of the mountain. The difference of Latitude and longitude:

1 degree 110 km / 60 = 1m / 60 the second. One cane direct measure by scale on Topo sheet available in Earth Science Labs, and multiply with scale. It is estimated to be Base Width of the Mountain is 4.00 Km. From East to west, where exploration done, It’s Radius will be 2.0 km. Thus the base of Triangle. = 2000m, from the periphery to the center of K. Mountain. Area of Kudargarh mountain is 2,88,00,000 m² Including all expansion shown in Figure16 and the area of Plateau is L x W = 5000 x 3000 = 150,00,000
All special spots of Kuda garh mountain are represented in table 1. And Table 2 represents comparative study of mountains of Chhattisgarh State in India.

**RIVULET AND FALL:** Figure 7 Represents Kudargarhi rivulet making below Nagdabra, depicted in figure 8. Dabara is a large ditch with water and Nag is the Cobra snake. Thus it is a snake point. And water fall point. Fall is a natural beauty to attract tourism, and ritual to have wash before enter a temple. From here at 31 meters height this rivulet would meets again. Here *Ipomoea equatica* hydrophyte plant in a hanging with water fall could remarkable.

**CAVE SCIENCE:** Shree Bagheshwari Temple is depicted in Figure 9 and Figure10 represents cave of Deo Jhagarakhand are the caves Cut on Rock of KM. at he peak on Plateau there are caves like Lagorin Ghutara depicted in figure 11 , Figure13 represents to Kohabargufa. “Kohabar” means feast of big party. And Figure14 represents to Balam Cave. It is said that it was private cave of Kings Balam.

**ROCK SCULPTURE:** Petro graph are Social value of mountain. Statue of Goddess Bagheshwari, at Both Temples new on less height and old at the peak plateau. A statue is having like Narsingh (Lion mouth human). In all caves on the inner wall there is beautiful statue of Goddess form and Imps, Lines, Snake, lotus and Trident morphed sculptures Some Petrographs are not encoded like on the wall written, represented in Figure 19. This was probably Study room of King Balam.

**BIODIVERSITY:** Kudargarh is rich in Forst Plant and animal Biodiversity although on the plateau there is also bare land.(FIG Mythological Philosophical and Natural figure is found in this forest . there are news of Tiger attack.[25,26,27 ] Thus all trophic levels of forest and hill ecology are living in Kudargarh forest . Monkeys interact with human Therefore, Should be Careful. The Taxonomy of Biodiversity is studied in Table form [24]

**PHILOSOPHY:** First January 2012 is the Date of District Nomination Surajpur , at before was a Revenue area and seen tuff to hike on this Mountain of Goddess Lion. Before this, it is studied in “AMDG sonnet songs” page of picnic [25]. There is yet evidence of Lion in News Papers and media [26] Panther, Fox, Deer’s Snakes, Birds Reptiles and Sal Forest’s all trees, Lians, Bells shrubs and herbs and cryptogames plants of are Found in Kudargarh mountain their Taxonomy and identification is available [27] Temple is at the height of 200 m .at the temple of Bageshwari (Goddess Lion) and 15m is more height to the peak of mountain at the ruined Fort (Palace) of ancient King ‘ Balam Singh, who established the Kudargarhi Temple (synonym). Thus total height of mountain is 61m. there are balm hill balm pond and balam village at about 10-15 km. Jhagarakhand Deo, is a Bhairava of Bagheshwari Deity. For His honor, Jhagarakhand is named a town below Siddha baba Hill in Manendragarh district in the Indian state of Chhattisgarh. Ma Kudargarhi Devi mandir is one of the oldest temples of Chhattisgarh situated on top of a hill and is the major attraction in Kudargarh. Kudargarh Mahotsav is a vibrant and colorful festival celebrated with great enthusiasm in Surajpur district of Chhattisgarh, India. This festival is a symbol of the rich cultural heritage of the region and is celebrated every year with great zeal and enthusiasm. The festival begins with a grand procession of the idol of the Goddess, accompanied by traditional music and dance performances. The highlight of the festival is the cultural program, which includes various folk dances and music performances by local artists.
<table>
<thead>
<tr>
<th>Srl.</th>
<th>Places</th>
<th>Figure Number</th>
<th>Geomorphology</th>
<th>Stair Count</th>
<th>Distance</th>
<th>Height</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Entrance</td>
<td>6</td>
<td>Arch door</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Reception</td>
</tr>
<tr>
<td>2</td>
<td>Suraj Dhara</td>
<td>7</td>
<td>Water Fall</td>
<td>20</td>
<td>5m</td>
<td>1.5m</td>
<td>Waterfall</td>
</tr>
<tr>
<td>3</td>
<td>Nagdabara</td>
<td>8</td>
<td>Watery Cave</td>
<td>10</td>
<td>3m</td>
<td>1m</td>
<td>Snake Point</td>
</tr>
<tr>
<td>4</td>
<td>Baghrswari</td>
<td>9,11,13</td>
<td>Petro graph</td>
<td>800</td>
<td>1050m</td>
<td>220m</td>
<td>Goddess Lioness</td>
</tr>
<tr>
<td>5</td>
<td>Jhagarakhand</td>
<td>10</td>
<td>Petro graph</td>
<td>800</td>
<td>1060m</td>
<td>232m</td>
<td>Bhairava of Lioness</td>
</tr>
<tr>
<td>6</td>
<td>Lagori ghutara</td>
<td>11</td>
<td>Petro graph</td>
<td>xx</td>
<td>1400m</td>
<td>230m</td>
<td>Old Temple</td>
</tr>
<tr>
<td>7</td>
<td>Stone Chair</td>
<td>12</td>
<td>Petro graph</td>
<td>xx</td>
<td>1500m</td>
<td>230m</td>
<td>Monument</td>
</tr>
<tr>
<td>8</td>
<td>Kohhabat Gufa</td>
<td>13</td>
<td>Dry Cave</td>
<td>xx</td>
<td>1650m</td>
<td>248m</td>
<td>Large Cave for meeting</td>
</tr>
<tr>
<td>9</td>
<td>Balam Cave</td>
<td>14</td>
<td>Dry Cave</td>
<td>xx</td>
<td>2000m</td>
<td>250m</td>
<td>Small Cave</td>
</tr>
<tr>
<td>10</td>
<td>Balam Fort</td>
<td>15</td>
<td>Ruined Fort</td>
<td>xx</td>
<td>1800m</td>
<td>250m</td>
<td>Garbage of Stones</td>
</tr>
</tbody>
</table>
Table 2 Comparative Montology of the Chhattisgarh state

<table>
<thead>
<tr>
<th>Srl.</th>
<th>Mountain</th>
<th>District</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Altitude</th>
<th>Height</th>
<th>Plateau Area</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Siddha Baba Hill</td>
<td>Manendragarh</td>
<td>23°20'39&quot;N</td>
<td>82°01'9&quot;E</td>
<td>502m</td>
<td>235m</td>
<td>3Km²</td>
<td>Border of CG to MP</td>
</tr>
<tr>
<td>2</td>
<td>Mainpat mountain</td>
<td>Surguja</td>
<td>22°49'15&quot;N</td>
<td>83°15'8&quot;E</td>
<td>1078m</td>
<td>540m</td>
<td>265Km²</td>
<td>Plateau has many Vilages</td>
</tr>
<tr>
<td>3</td>
<td>RamGarh Mountain</td>
<td>Surguja</td>
<td>22°83'27&quot;N</td>
<td>82°96'52&quot;E</td>
<td>980m</td>
<td>460m</td>
<td>10Km²</td>
<td>Devoted to God Ram</td>
</tr>
<tr>
<td>4</td>
<td>Mekal mountain</td>
<td>Pendra</td>
<td>22°67'20&quot;N</td>
<td>82°15’ 32&quot;E.</td>
<td>1,048 m</td>
<td></td>
<td>25Km²</td>
<td>Origin of Narmada River</td>
</tr>
<tr>
<td>5</td>
<td>Chilpi mountain</td>
<td>Kabirdham</td>
<td>22°15'0&quot;N</td>
<td>81°33'0&quot;E</td>
<td>380m</td>
<td>230m</td>
<td>96Km²</td>
<td>Border of CG to MP</td>
</tr>
<tr>
<td>6</td>
<td>Kudargarh mountain</td>
<td>Surajpur</td>
<td>23°51'5&quot;N</td>
<td>82°69'96&quot;E</td>
<td>650m</td>
<td>250m</td>
<td>15Km²</td>
<td>Devoted to Bagheswari Devi</td>
</tr>
</tbody>
</table>

PRECAUTION:

1. Timing of Exploration: Land erosion can be in rainy season. Therefore, Spring Season to May - June is best for exploration.
2. Danger of Tiger: Two killed in tiger attack, fear of tiger presence in the forest of Kudargarh mountain, people are warned by Govt. authority.
3. Beware from monkey, prefer Team study: and not go alone in Remote forest. Criminal Tribal may disturb calm of mountain.
4. Have Holy and Honesty because it is a sanctum mountain. Picnic and parties are not allowed.

CONCLUSION:

1. The Height of Kudargarh Mountain is 250m. and it has all geomorphology of mountain like forest, caves, Rocks, River, and Biodiversity.
2. Satellite view of Kudargarh mountain looking like sit Lion Since its makes a vast Plateau of 05 Km Long and 03Km wide, thus 15Km² Area. Therefore it is Named Bagheswari Temple on Kudargarh Mountain.
3. The Jhagarakhand is also a name of Deity with Bhilosophy of Ramgarh Mountain at Udaypur, Surguja CG India.

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