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# Mapping The Terrain: A Study of Contour Analysis

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**Abstract** - Contour analysis is a pivotal process for architects and landscape designers, integral in seamlessly integrating designs with the natural terrain. By scrutinizing the geographical features of a site, designers gain invaluable insights that inform decisions in overall site planning. This research delves into the art of interpreting contours, offering a nuanced understanding of spatial navigation, sensory experiences, and aesthetics within architectural spaces through straightforward methodologies.

Understanding the subtle undulations of the land enables architects to harmonize structures with the existing landscape, fostering a sense of unity. The contours serve as a blueprint for creating designs that not only blend seamlessly but also enhance the overall user experience. This investigation focuses on distilling complex topographical information into practical insights, providing designers with accessible tools to navigate the intricate relationship between built environments and natural surroundings. By unraveling the language of contours, architects and designers can unlock the potential for creating spaces that not only aesthetically please but also prioritize functionality and coherence with the environment.

***Key Words***: Contour, fist, water flow, landscape.

## 1. INTRODUCTION

Site analysis is about researching the existing conditions of the project site, including any potential future conditions dealing with factors such as social, historical, climatic, geographic, legal and infrastructure aspects of the location in order to aid the design process. This work is delivered as site analysis diagrams allowing architects to make more insightful decisions when designing their structure. Site analysis helps landscape architects identify ecologically sensitive areas, preserve ecosystems, evaluate microclimate, and understand site context and water drainage patterns. It provides fundamental information to engineers about soil quality and stability in order to design foundations, informs placement of infrastructural elements, helps in earthwork calculation etc.

## 2. UNDERSTANDING CONTOUR

Contour analysis is an essential aspect of site analysis. It refers to the process of studying and analyzing existing contours of a site. This analysis is vital in architectural design and planning for several reasons like site understanding, natural landscape, water drainage and management, environmental sustainability, stability of ground for foundation design, creative design opportunities, and so on.

A contour refers to the existing topographical features of a site or landscape. This is a comprehensive and detailed survey designed to understand the grooves and ridges of an existing landscape and how they differ from region to region. The process of tracing contours is called contouring. A map that clearly shows the contours of a valley, hill or ridge is called a contour map. A topographic map however can also be used for the same. Contour maps give planners and designers an accurate idea of the elevation, slope and shape of the land.

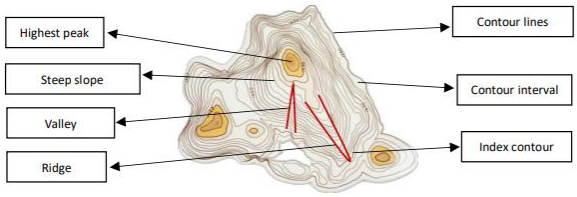


**Figure 1:** Understanding the different terminologies of Contour analysis

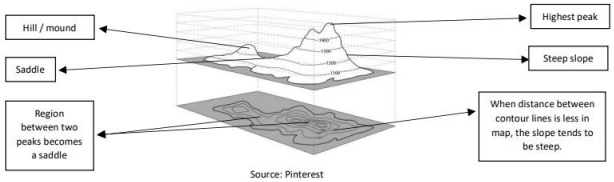


**Figure 2:** Understanding the different terminologies of Contour analysis

## 3. TERMINOLGY

1. Contour Line: A contour line is a continuous line on the map that connects points of equal elevation with reference to mean sea level.
2. Contour Interval: The contour interval is the vertical distance between adjacent contour lines. The smaller the distance, the steeper is the slope while larger distances represent gradual slopes or flat terrain.
3. Index Contour: Every fifth contour line is made thicker and labeled with the elevation value for ease of reading.
4. Topographic Map: A map that represents the surface features of a region in detail, using contour lines to show changes in elevation.

5. Depression Contour: A contour line with small hachures (short lines) inside it, indicating a crater or basin.
6. Ridge: A line of high ground with slopes descending on both sides.
7. Valley: A line of low ground between two higher areas.
8. Saddle: A low point along a ridge or between two hills which is represented by a contour line with two humps on either side.
9. Gradient: The steepness of the terrain is indicated by closely spaced contour lines, while gentle slopes have widely spaced contour lines.
10. Contouring: The process of creating contour lines on a map to represent the three-dimensional surface of the Earth.

## 4. VISUALIZING CONTOUR LINES

We visualize contour lines as stacked "layers" of the landscape, similar to layering a cake. A topographic/contour map provides a bird's eye view of concentric circles i.e. contour lines, allowing us to see both the height and shape of the terrain on the map.

A quick exercise can be done for a better understanding of contour lines:

1. Make a fist with your hand. You see four knuckles (peaks), the back of your hand (a gentle slope), four fingers (mild ridges), and spaces between adjacent fingers (valleys).
2. Mark an "X" on the knuckle that sticks up the highest. This is the "summit". Make contour lines that are spaced out at equal distances around the peak of the knuckle mountain. The contour lines must be in closed circles. Map out the entire fist this way.
3. Next, lay your hand flat with your palm on the table. Observe that the distance between the contour lines get bigger, indicating a gentle slope. Notice the "v" shaped contour lines where the valleys are between your fingers. The areas at the fingers have contour lines that are close together, indicating steepness. The hourglass-shaped contour line represents the saddle between the knuckles.

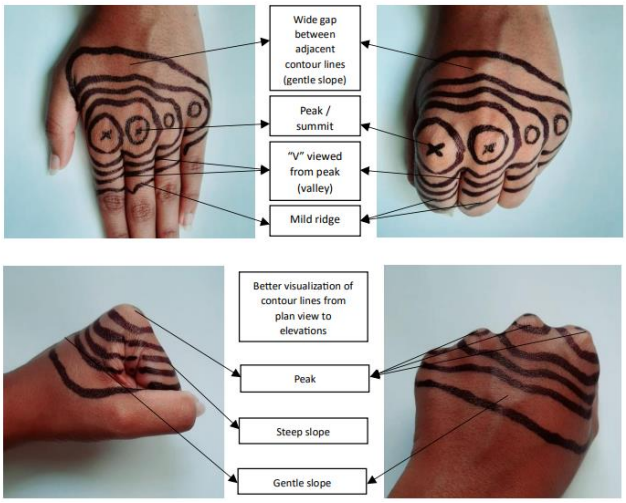


**Figure 3:** Understanding contours lines by visualizing using fist.

## 5. CONTOUR ANALYSIS METHODOLOGY

The design brief was to come up with a fashion institute on the given site. The attempt was to retain contours in order to respect the terrain and not go against nature. In order to do so, the contours had to be understood well

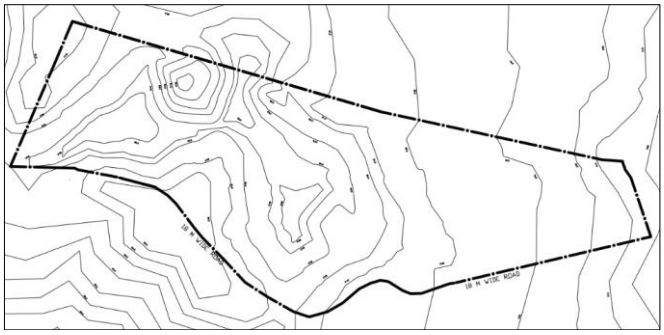

**Figure 4:** The above site with interesting contours is located in Banashankari 6th stage, Karnataka.

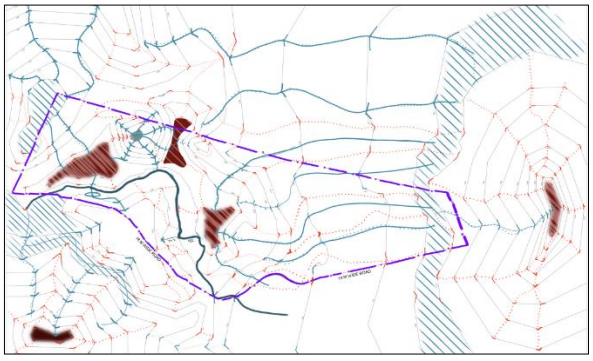

**Figure 5 :** Reading the contours and producing insights

Identification of features were done from the contour map with surroundings for better understanding.

1. Peak of hill was marked by concentric contour lines and elevation value.
2. Placing ourselves at the peak and looking down the terrain gave us "V" and "A" shapes.
3. The "V" from the peak indicates a valley and an "A" from the peak indicates a ridge.
4. The major valleys were then identified by studying the pattern of slope.
5. Lastly, water drainage points were noted within as well as around the site.

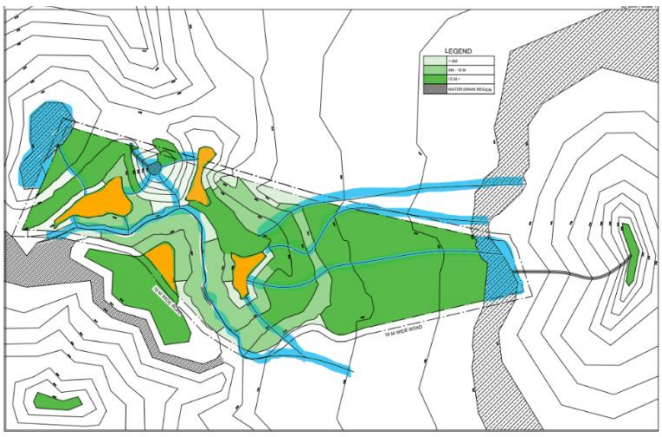

**Figure 7:** Highlighting insights and studying the slope to generate buildable and non-buildable regions.

## 6. CONCLUSION

After analyzing the data collected, certain inferences were made:

1. The yellow regions are the highest points of the site at 85m (peaks).
2. Blue lines are the major valleys running along the site (they are joined by smaller valleys). All valleys start from the peak and drain into lower points on the terrain.
3. There is always a ridge (prominent or mild) between every adjacent valley.
4. Low land or depressions become draining areas or end of valleys.
5. Slope analysis was done to recognize buildable and non-buildable region in order to avoid altering the natural slope and produce a design that is in harmony with the existing terrain.

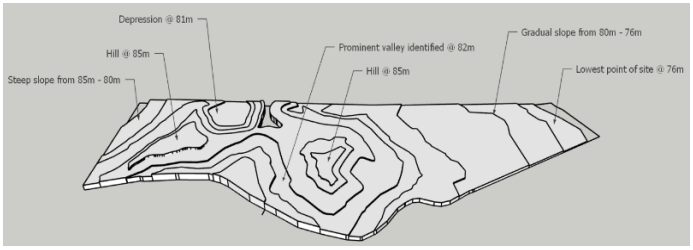


**Figure 8:** A 3D Sketch-up view of the given site helps us comprehend the contour map and verify our analysis and findings

## 7. REFERENCES

1. Bai, Xiang, Wenyu Liu, and Zhuowen Tu. 2009. "Integrating Contour and Skeleton for Shape Classification." 2009 IEEE 12th International Conference on Computer Vision Workshops, ICCV Workshops 2009: 360–67.
2. Gauch, John M., and Stephen M. Pizer. 1993. "Multiresolution Analysis of Ridges and Valleys in Grey-Scale Images." IEEE Transactions on Pattern Analysis and Machine Intelligence 15(6): 635–46.
3. Gong, Xin Yi et al. 2018. "An Overview of Contour Detection Approaches." International Journal of Automation and Computing 15(6): 656–72.
4. Graves, Martin J. et al. 2000. "A Multicenter Validation of an Active Contour-Based Left Ventricular Analysis Technique." Journal of Magnetic Resonance Imaging 12(2): 232–39.
5. Malik, Jitendra, Serge Belongie, Thomas Leung, and Jianbo Shi. 2001. "Contour and Texture Analysis for Image Segmentation." International Journal of Computer Vision 43(1): 7–27.
6. Theodoridis, Theodoros, and Juergen Kraemer.
7. Troeh, F. R. 1965. "Landform Equations Fitted to Contour Maps." American Journal of Science 263(7): 616–27.