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A Three-Dimensional Representation of the Piles Radio Image on the Radargram for the Completed Construction

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ABSTRACT

One of the important issues in urban geolocation is the determination of the depth of piles within the scope of geolocation activity. The peculiarity of the complexity of the issue lies in the heterogeneity of the work environment, which can be found both in an open space, such as a construction site, and in a closed, i.e. completed and put into operation building. Conducting geolocation profiles under operational building conditions is also limited due to existing partitions and architectural elements of non-conducive placement. In some cases, we are forced to limit ourselves by taking partial profiles and use a complicated interpretation for such a radargram. In particular, we additionally use the three-dimensional spatial representation for the intersections of geolocation profiles to determine the depth of the target pile. For the interpretation of the depth limit of pile, it is recommended to fix the location of the hyperbola of the pile radio image on the axis of intersection of the intersecting profiles for both profiles, to imagine and interpret the 3D radio image of the target pile for the intersection axis of the profiles.
***Key words**: urban geolocation, radio image, depth of piles, radargram.*

Introduction

One of the important issues in urban georadiolocation is the determination of the depth of piles within the georadiolocation activity [1, 2, 3, 4]. The peculiarity of the complexity of the issue lies in the heterogeneity of the working environment, which can be found both in an open space, such as a construction site and in a closed, i.e. completed and put into operation, building. Conducting geolocation profiles under operational building conditions is also limited due to existing partitions and architectural elements of non-conducive placement. In some cases, we are forced to limit ourselves by taking partial profiles and use a complicated interpretation for such a radargram. In particular, we additionally use the three-dimensional spatial representation for the intersections of geolocation profiles to determine the depth of the target pile.

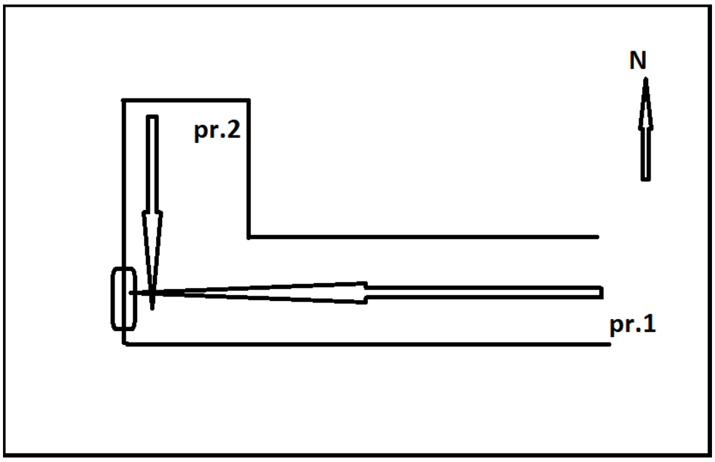
Task

For the completed and operational medical building, it was necessary to determine the crossing of one of the corners of pile. The problem was the presence of limited space because a complete geolocation profile could not be conducted. It was decided to perform two mutually directed georadar profiles, at the intersection of which the target pile was placed in the corner of the walls.

Method and instrumental part

On the first floor of the completed building, the deepening of the load-bearing pile was to be investigated in the internal area. The survey was carried out using georadiolocation method georadar Zond12e, with official software "Prizm-6.0", for further, three-dimensional interpretation, compatible software - "Voxler 4" was used.

Two intersecting profiles were conducted, the schematic representation of which is given in the schematic drawing (Scheme 1).



Scheme 1. The diagram shows the conditional location of geolocation profiles 1-2 and shows the probable location of pile.

Data and reasoning

It follows from the interpretation of Prof. 1 presented on the radargram (Fig. 1) that the pile radio image was marked at distances of 15-16m and at a depth of 9m on average. The radio image is marked with white lines.

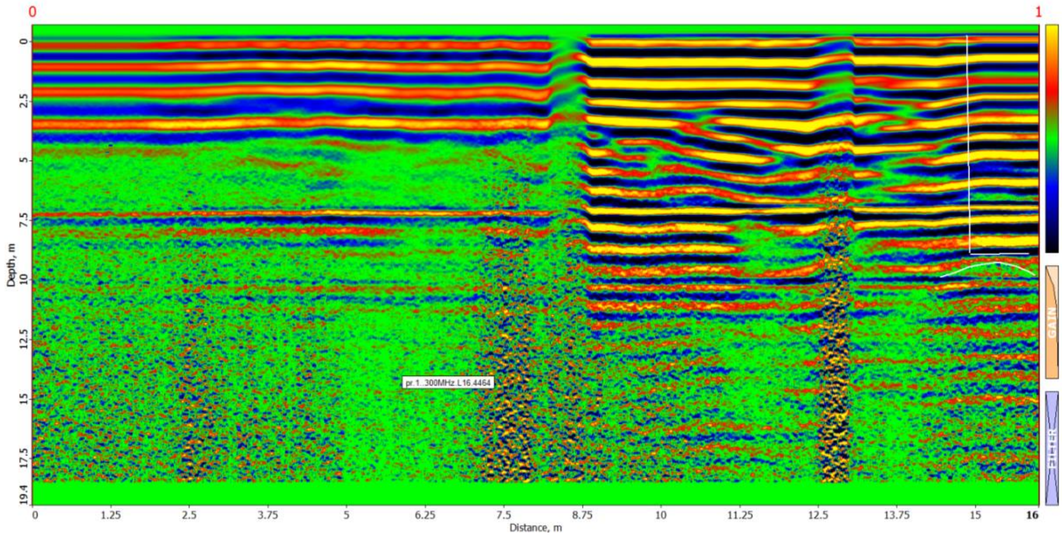


Fig. 1. Radargram Prof. 1, length -16 m, is presented Zond-12e with standard shielded antenna 300MHz.

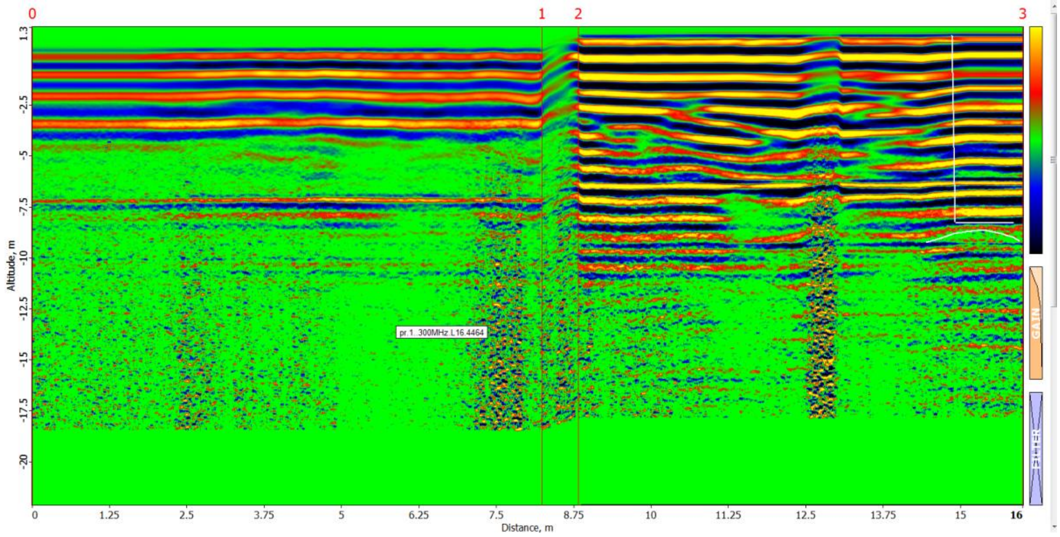


Fig. 2. Radargram Prof. 1 is presented, length - 16 m. It is made with a standard shielded radar antenna of 300MHz. The topographic effect is taken into account.

For visualization, Prof. 1 (Fig. 2) has been added to the radar chart, the pile radio image has been marked at a distance 15-16 m and at a depth of 9m. Since the base of the borehole is naturally uneven, the lateral placement of the poured concrete is also uneven, thus the plane of the base of pile changes within the limits of 8.9-9.2m. The radar profile passed through one side of pile; the other sides are covered by the wall construction.

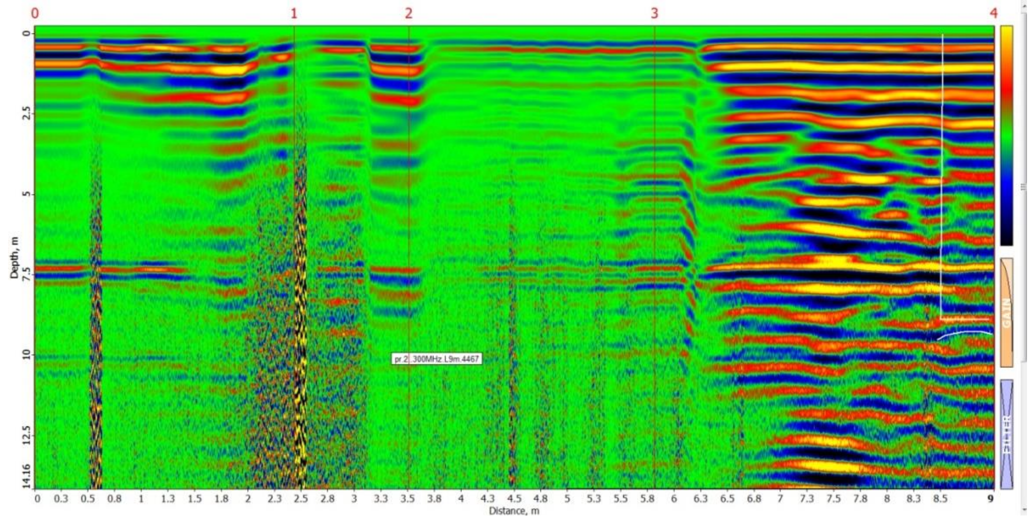


Fig. 3. Presents radargram Prof. 2, length -9m. It is made with a standard radar shielded antenna of 300MHz.

From the Prof. 2 (Fig. 3) interpretation presented on the radar chart, it follows that the pile radio image was marked at a distance 8.5-9m and at a depth 9m.

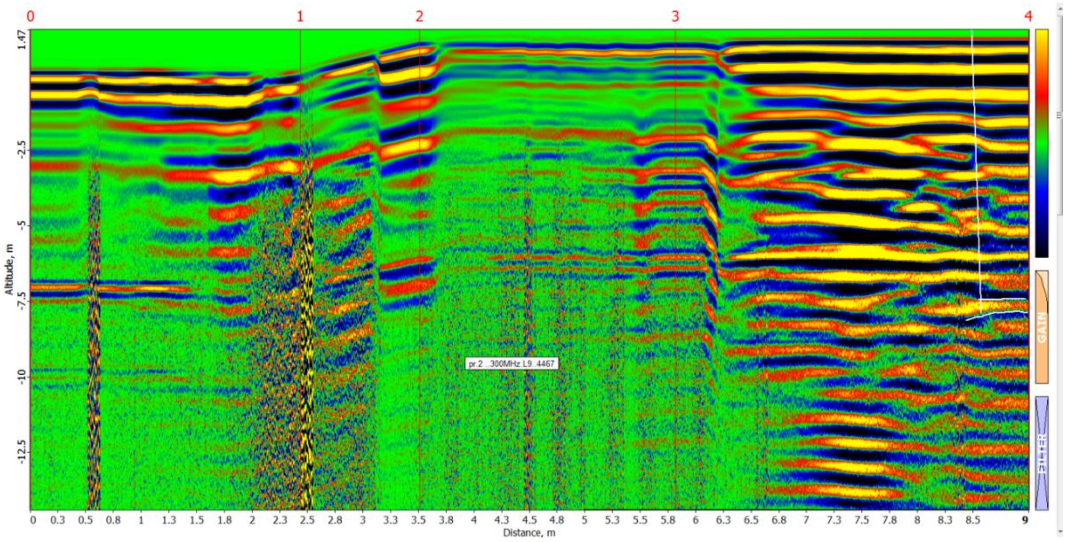


Fig. 4. Radargram Prof. 2, length -9m is presented. It is made with a standard radar shielded antenna of 300MHz. The topographical effect is taken into account.

From the Prof. 2 interpretation on the radar chart, it follows that the pile radio image was marked at a distance 8.5-9m and at a depth of 9m. Since the base of the borehole is naturally uneven, the lateral placement of the poured concrete is also uneven, thus the sections of the pile base vary within the limits of 8.9-9.2m, the results of profile-2 coincide with the results of profile-1 within the location of the hyperbola indicator.

The radio view of the object of vertical placement recorded by Prof. 1 and Prof. 2 corresponds to the pile with a depth of 9-9.2 m.

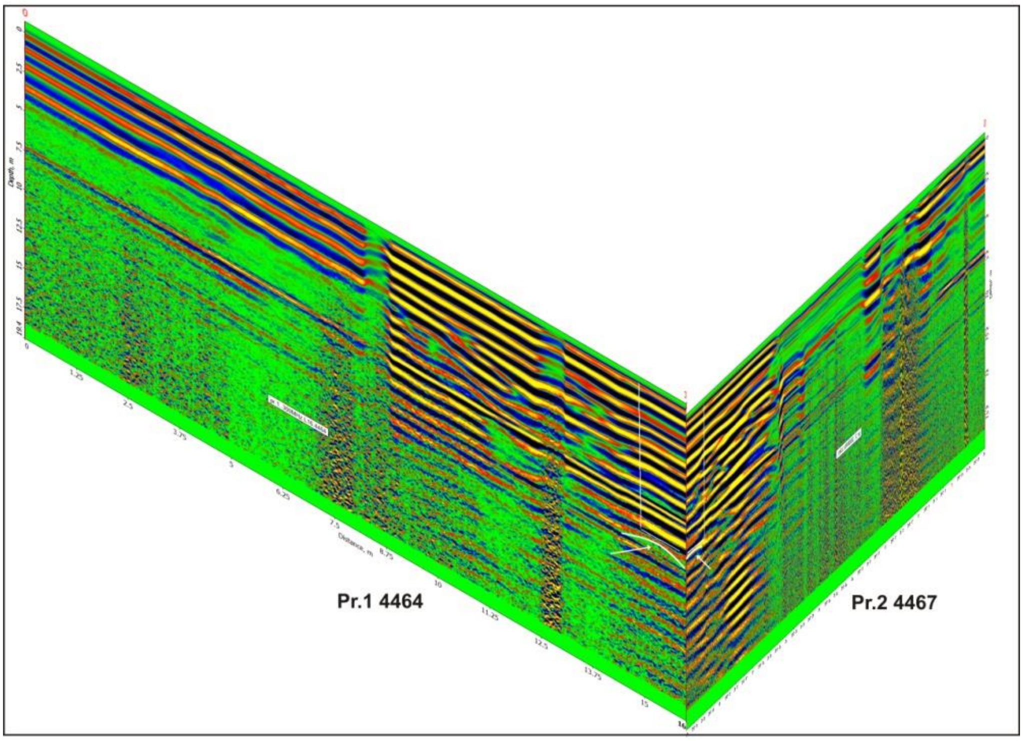


Fig. 5. Radargram Prof. 1 and Prof. 2 are presented, the target pile is located at the intersection, it is made with the radar staff screened antenna 300MHz.

At the intersection of Profiles-1, 2 (Fig. 5) the location of the hyperbola indicating the pile radio image was identified. Shown by a white circle adjacent to the synphasic axis.

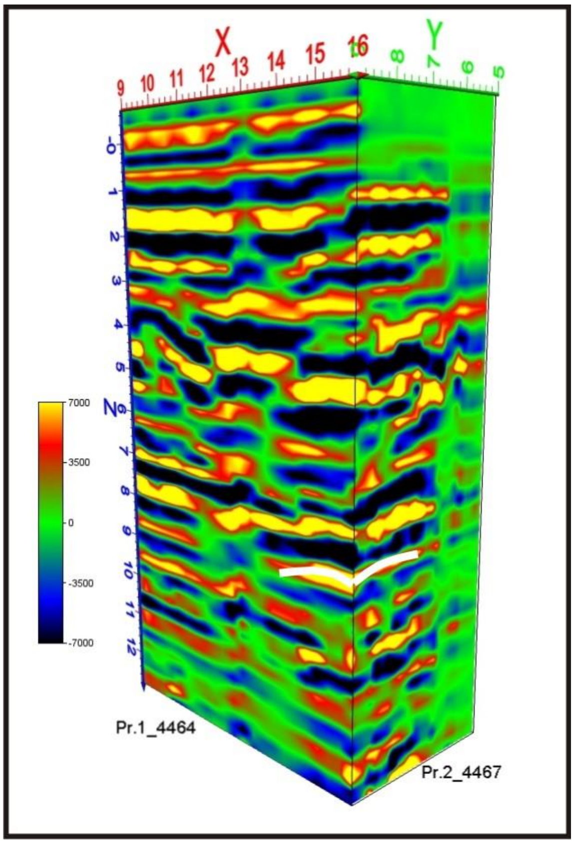


Fig. 6. An excerpt from the spatial representation of the intersection of profiles-1, 2 is provided. The 3D radio image is built using Voxler 4 software.

The radargram presented in Fig. 6 clearly defines the hyperbola marked with white circles for the target, the carrier pile 3D radio image, which uniquely characterizes the deepening of pile as a physical object and its location.

Conclusion

For the interpretation of the depth limit of pile, it is recommended to fix the location of the hyperbola of the pile radio face in the cross section of the intersecting profiles for both profiles, to imagine and interpret the 3D radio face for the target pile for the axis of the intersection of the profiles.

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რადაროგრამაზე ხიმინჯის რადიოსახის სამგანზომილებიანი წარმოდგენა დასრულებული ნაგებობისთვის

დ. ოდილავაძე, თ. ჭელიძე, ო. იავოლოვსკაია

რეზიუმე

ურბანულ გეორადიოლოკაციაში ერთერთი მნიშვნელოვანი საკითხია ხიმინჯების დაღრმავების განსაზღვრა გეორადიოლოკაციური აქტივობის ფარგლებში. საკითხის სირთულის თავისებურება მდგომარეობს სამუშაო გარემოს არაერთგვაროვნებაში, რომელიც შეიძლება აღმოჩნდეს როგორც ღია სივრცეში (მაგალითად, სამშენებლო მოედანი), ასევე დახურულ, ანუ დასრულებულ და ექსპლუატაციაში შესული შენობის პირობებში. ექსპლუატაციაში მყოფი შენობის პირობებში გეორადიოლოკაციური პროფილების გატარება ერთობ შეზღუდულია არსებული ტიხრებისა და არა ხელშემწყობი განთავსების არქიტექტურული ელემენტების გამო. ზოგ შემთხვევაში იძულებული ვხვდებით შემოვისაზღვროთ ნაწილობრივი პროფილების გატარებითა და ასეთი რადაროგრამისთვის გართულებული ინტერპრეტაცია გამოვიყენოთ. კერძოდ, დამატებით ვიყენებთ სამგანზომილებიან სივრცულ წარმოდგენას გეორადიოლოკაციური პროფილების გადაკვეთებისთვის სამიზნე ხიმინჯის დაღრმავების განსაზღვრისთვის. ხიმინჯის დაღრმავების განსაზღრვრის ინტერპრეტაციისათვის რეკომენდებულია დაფიქსირდეს ხიმინჯის რადიოსახის ჰიპერბოლის მდებარეობა გადამკვეთი

პროფილების გადაკვეთის ღერძზე ორივე პროფილისთვის, აიგოს და ინტერპრეტირდეს პროფილთა გადაკვეთის ღერძისთვის 3D რადიოსახე სამიზნე ხიმინჯისთვის.

საკვანძო სიტყვები: ურბანულ გეორადიოლოკაცია, ხიმინჯის დაღრმავების ინტერპრეტაცია, რადიოსახე, რადაროგრამა.

Трехмерное изображение радиообраза свай на радарограмме для завершенного строения

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Резюме

Одним из важных вопросов городской геолокации является определение глубины свай в рамках геолокационной деятельности. Особенность и сложность вопроса заключается в неоднородности рабочей среды, которую можно встретить как на открытом пространстве, например, на строительной площадке, так и в закрытом, т.е. завершенном и введенном в эксплуатацию здании. Проведение геолокационных профилей в условиях эксплуатации здания также ограничено из-за существующих перегородок и архитектурных элементов неблагоприятного размещения. В некоторых случаях мы вынуждены ограничиться получением частичных профилей и использовать сложную интерпретацию такой радарограммы. В частности, мы дополнительно используем трехмерное пространственное представление пересечений профилей геолокации для определения глубины целевой сваи. Для интерпретации границы глубины сваи рекомендуется зафиксировать расположение гиперболы радиообраза сваи на оси пересечения пересекающихся профилей для обоих профилей, представить и интерпретировать 3D радиообраз целевой сваи для оси пересечения профилей.

Ключевые слова: радиообраз, глубинные сваи, радарограмма, городская геолокация.