AoA   UWB

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A Single- Anchor based UWB Localization Technique using Angle- of- Arrival(AoA) Scheme

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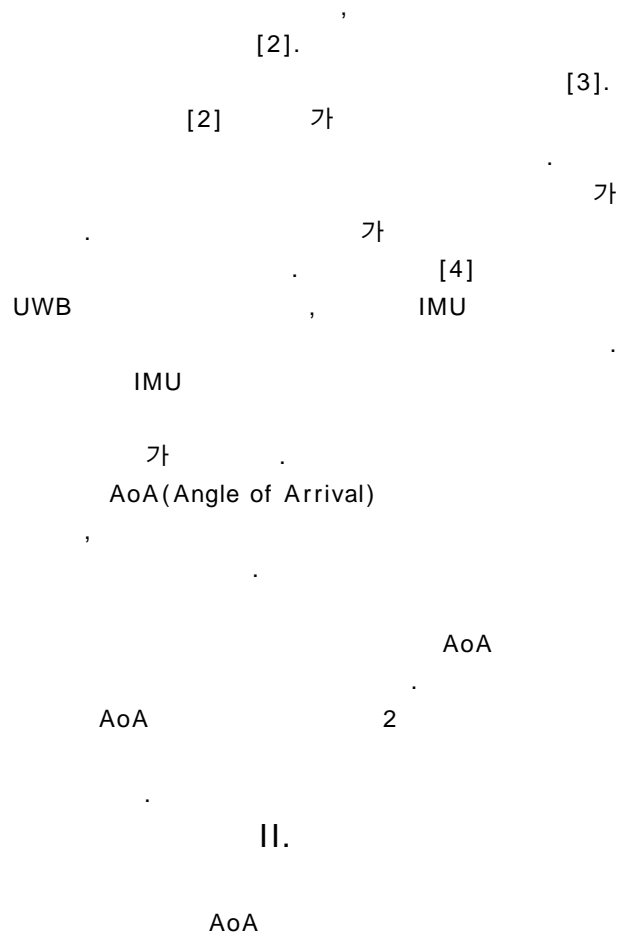Department of AI Convergence Network

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Abstract

This paper proposes a method to pinpoint the location of a moving tag in systems with a single UWB anchor where it is either impossible to locate the moving tag or errors occur. Traditional methods relying solely on the distance and angle between the anchor and the tag allowed for positioning only on a straight line. However, with the proposed method, experiments were conducted across four predetermined straight lines in a 2D coordinate system. The results of this study demonstrate that the proposed method can accurately locate a moving tag with a short average error distance, and when the tag is close to the anchor, it can precisely position it on the actual path taken.

I.

,

[1].   UWB(Ultra- Wideband)
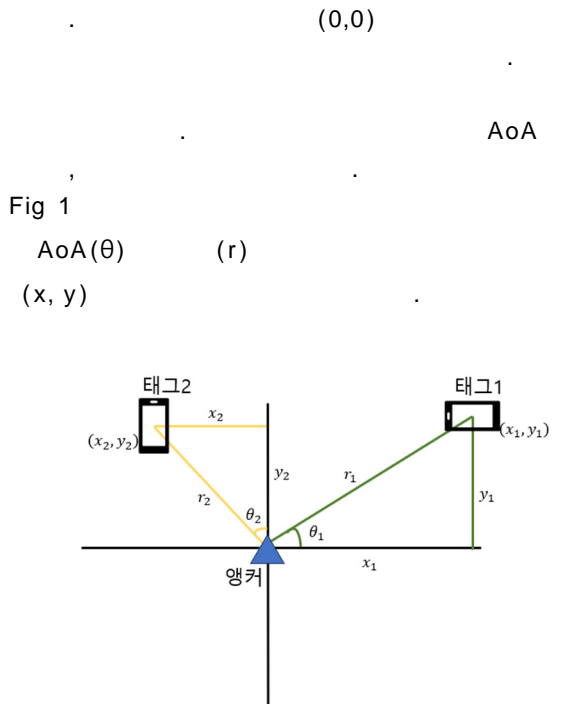
. UWB

.

[2].

[3].

[2]

.

.   [4]

UWB   ,   IMU

IMU

.

AoA(Angle of Arrival)

,

.

AoA

.

AoA   2

.

II.

AoA

.   (0,0)   .
                                                        .
                          AoA   1. AoA   .
,   .   2.   ± 30   ,
Fig 1   AoA
   AoA(θ)   (r)   .
(x, y)   .   3.   ,
                                                      (1),(2)   (4),(5)

Figure 1. 태그 방향에 따른 위치 추정 방법

                                                                        AoA
                                                          4
                                                                      .
,   ,
.   ,
$$\sin\theta_1 = \frac{y_1}{r_1} , y_1 = r_1 * \sin\theta_1 \tag{1}$$
$$\cos\theta_1 = \frac{x_1}{r_1} , x_1 = r_1 * \cos\theta_1 \tag{2}$$ Qorvo   DWM3001CDK
                                                            Apple
$$\sin\theta_2 = \frac{x_2}{r_2} , x_2 = r_2 * \sin\theta_2 \tag{3}$$ iPhone 12 Pro   .
                                              MAC   XCODE   Qorvo
$$\cos\theta_2 = \frac{y_2}{r_2} , y_2 = r_2 * \cos\theta_2 \tag{4}$$.
UWB   ns   30cm   (0,0)   ,
   [5].   ,   LOS(Line of Sight)   , 3m
                                                      .   ,
   ±30cm   , AoA   . Fig 2
                              .   .
                  ,
       2
       .

$$R(\theta) = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \tag{5}$$

$$\acute{x}, \acute{y} = R(\theta) * \begin{bmatrix} x \\ y \end{bmatrix} \tag{6}$$

Figure 2. 실험 결과

              Fig 1

,

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,

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Fig 2   AoA

,

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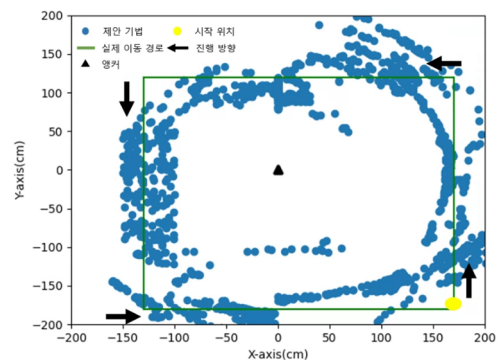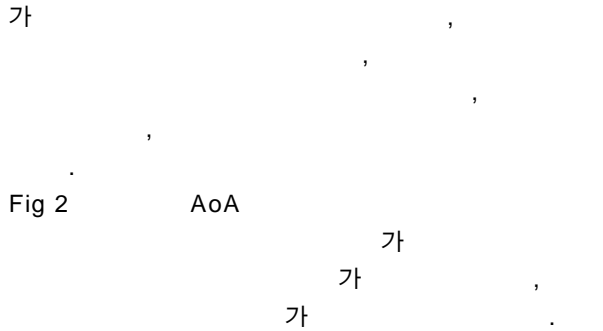
표 1. 오차 거리 분석

18.13cm	88.96cm	0cm

1

,   ,   .

18.13cm   ,

88.96cm   ,   0cm
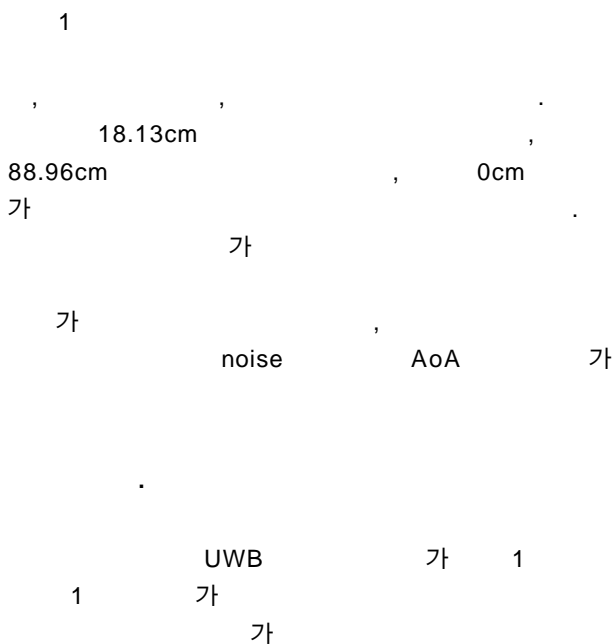
.

noise   AoA

.

UWB   1

1

. DWM3001CDK

iPhone 12 Pro

,

. , AoA   noise

.

,

.
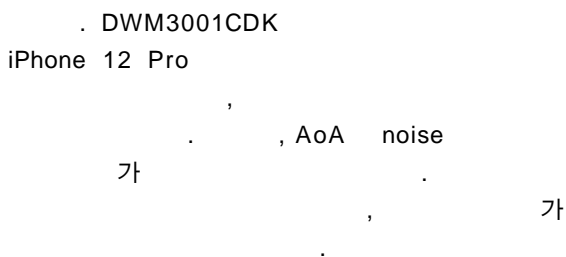
ACKNOWLEDGMENT

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