

Micromégas

Approches multi-échelles pour la navigation dans les masses de données familières

Visualisation Perspective Interactive



Site web

<http://insitu.lri.fr/micromegas/>

Site wiki

<http://wiki.lri.fr/micromegas/>

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Pléthore de l'information

sélectivité de l'utilisation de l'information

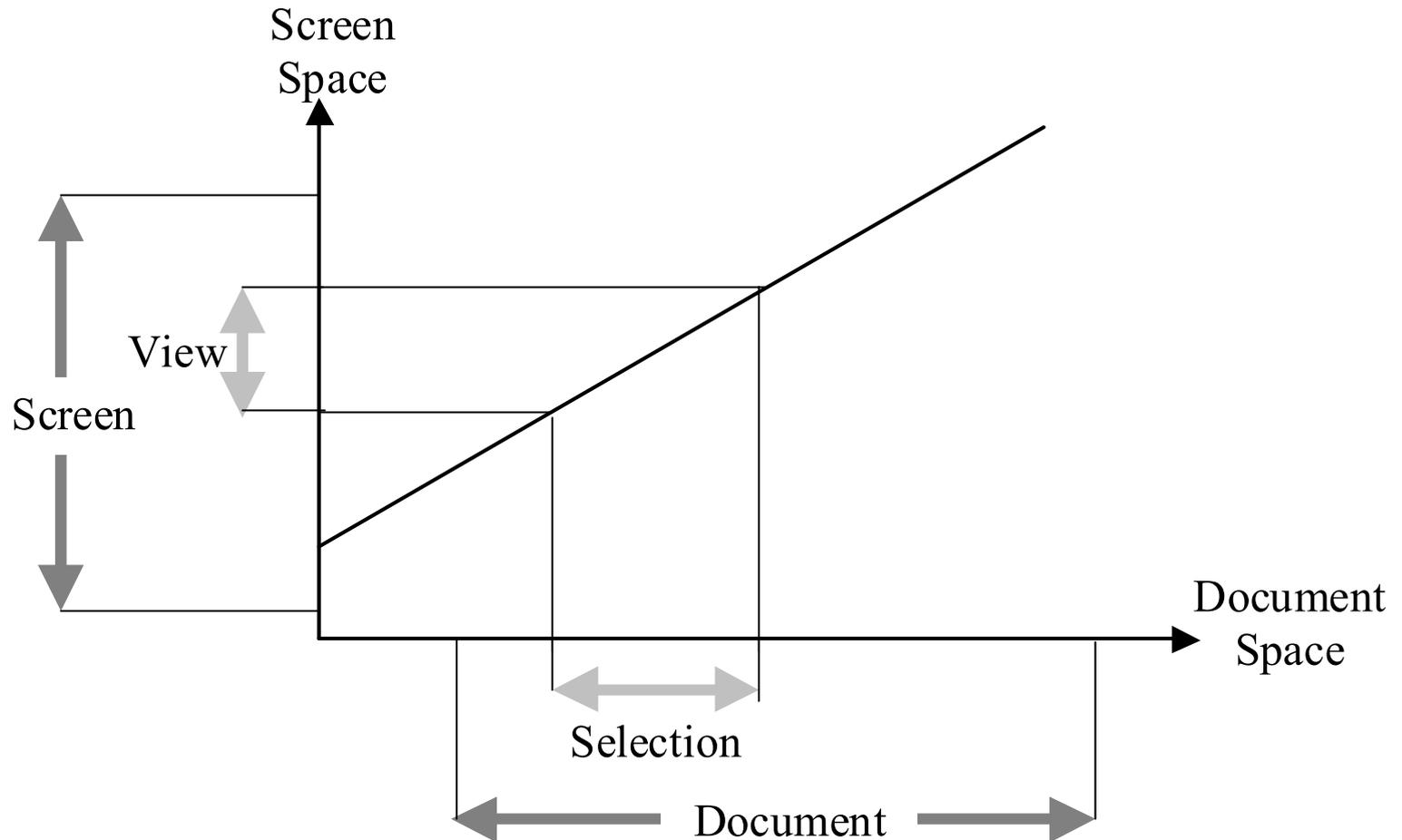
- Deux points de vue
 - Technologique: l'info numérisée accessible est pléthorique
 - Psychologique: l'info ambiante pour les sens est infinie
- Dans tous les cas, utiliser l'info c'est parcourir un espace
 - Perception du monde (visuelle, auditive, tactile etc.) suppose à chaque instant une *sélection* attentive
 - Sélection attentive *mobile*: notion de parcours
 - Ecouter = filtrer (e.g., cocktail party)
 - Regarder = balayer un point de fixation à travers une scène optique
 - Rechercher un item en mémoire = processus sériel (Sternberg)
- Navigation de l'espace d'un document électronique : un cas de figure paradigmatique
 - Espace d'information à naviguer: une surface plane

Recherche et navigation actives dans les masses de données

Navigation vers un élément connu et bien localisé
dans un *document* de grandes dimensions

- Activité cognitivement utile, complément indispensable aux procédures de recherche automatique (Finder, Google Desktop, etc.)

Navigation multi-échelle dans un document



Visualisation multi-échelle des documents

Etat de l'art

hair (i.e., the view) was actually moving across a target world. Once the cross hair was judged to be on target, validation had to be performed by pressing the button of the mouse. A hit caused the current array of concentric circles to be replaced at once by the alternative centered on the other target (located a long way away, out of the view, for difficult trials) and shown in the same color as the new target (see Figure 1). A miss (reflexion), and so an error always had to be corrected before the next movement could start.

Balanced using a 7 x 7 Latin square, whose lines were permuted from one participant to the next. Trial duration was varied according to the ID, so as to obtain an approximately equal number of movements in all ID conditions (by offering more time for trials with longer MFs). From the lowest to the highest ID, trial duration was 7.5, 12.2, 19.2, 29.8, 40.4, and 70.8 s.

The participants were tested individually. They began the session with several familiarization trials at various levels of difficulty. They were carefully shown how to use the zoom command, but they were left free to use it or not during experimental trials. Upon completion of each trial, the program displayed the distance as well as the zoom value of MF to encourage the participants to improve their speed.

Utilization of the Zoom
For the first two levels (bits), the zoom facility was just the mouse.⁶ For movements of all the participants, who were just the mouse.⁶ For movements of all the participants, who were just the mouse.⁶ For movements of all the participants, who were just the mouse.⁶

single MFs were obtained at the first two levels of difficulty. With all 40 trials included, the mean value of the overall estimate of Fitts' law was based on 300 to 400 individual measurements of $T_{1/2}$ —215 to 320 measurements with the first two trials discarded as warm-ups (see below).

Using as our metric the zooming amplitude of the zoom command (Z, which was varied between -10 and +10 bits), the zoom facility was systematically ignored by the participants, who were content to use the task with just the mouse.⁶ For higher levels of the ID, all the movements of all the participants involved the zoom.

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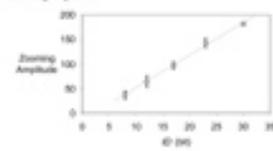


Figure 3. Mean zooming amplitude as a function of task difficulty.

⁶ The only exception was one participant occasionally trying to zoom for a few movements at ID = 7.5 bits, during his second and third trials.

cross hair (i.e., the view) was actually moving across a stationary world. Once the cross hair was judged to be on target, validation had to be performed by pressing the left button of the mouse. A hit caused the current array of concentric circles to be replaced at once by the alternative centered on the other target (located a long way away, out of the view, for difficult trials) and shown in the same color as the new target (see Figure 1). A miss (reflexion), and so an error always had to be corrected before the next movement could start.

Participants were asked to control pointing with the mouse assigned to their right, preferred hand and zooming with the mouse assigned to their left, non preferred hand (see Figure 2). Three-IDF tasks like that of the present experiment can be carried out with a single hand, using a wheel mouse. For the present experiment, however, we resorted to two-handed input because we had found in pilot testing that pointing and zooming could proceed more smoothly, in a partly parallel fashion. We assigned the zooming component of the task to the left hand and the pointing component to the right hand, only that vice versa, in keeping with the principles of Gale's kinematic chain model [12,15]. Since setting interaction scale determines the correct to immediately subsequent pointing act, the left component seems logically dependent on the left argument for assigning the pointing component to participants' right, preferred hand.

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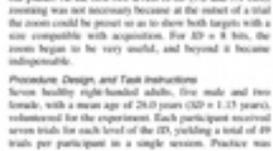


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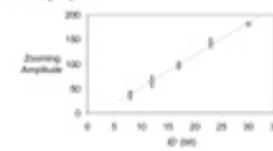


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Using the scaling invariant (equation 1), we first compute z_{in} and z_{out} . At scale z_{in} , the view (size V) covers the distance to target, D , and the target itself (size W), so we have:

$$(D + W) / 1 = V / z_{in} \quad \text{or} \quad z_{in} = V / (D + W)$$

At scale z_{out} , the view (size V') covers the target (size W) so we have:

$$W / 1 = V' / z_{out} \quad \text{or} \quad z_{out} = V' / W$$

We now compute Z :

$$Z = -\log z_{in} - \log z_{out} = -\log [V / (D + W)] - \log [V' / W] = -\log [V / (D + W)] - \log [V' / W]$$

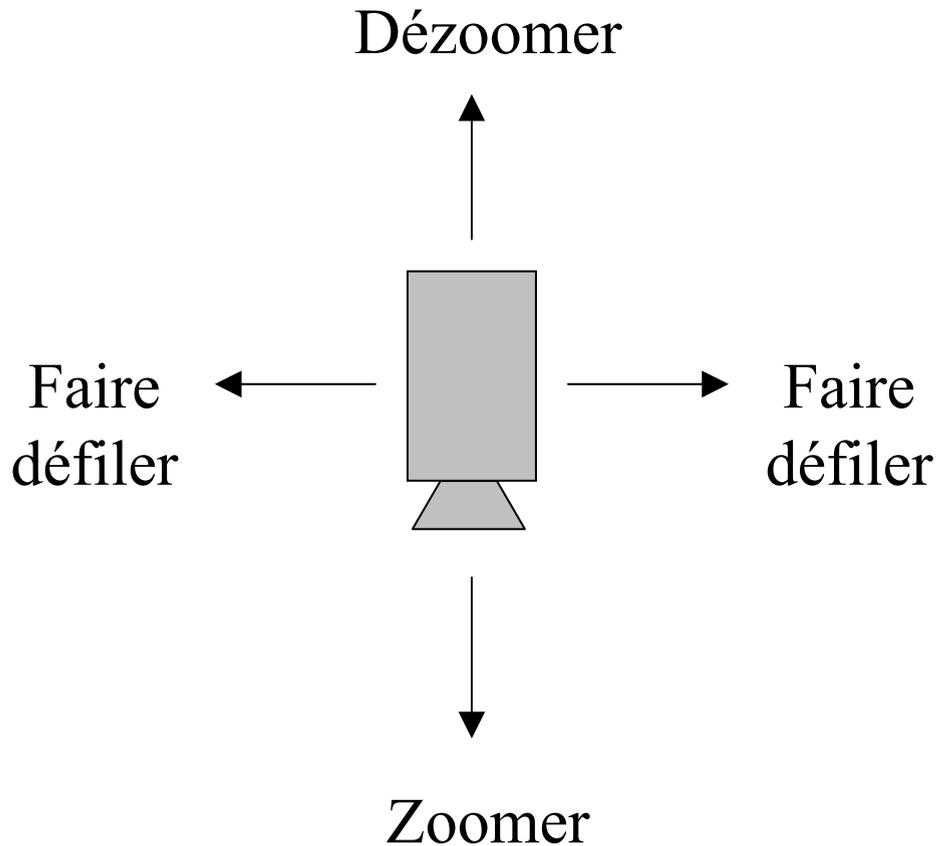
Therefore the distance to navigate in zoom-index space is strictly the index of difficulty of the

Bifocale
faible contraste micro-macro
simultanément

Fisheye
~ idem
simultanément

Pan-plus-zoom
large gamme d'échelles
séquentiellement

Etat de l'art: la technique pan-zoom

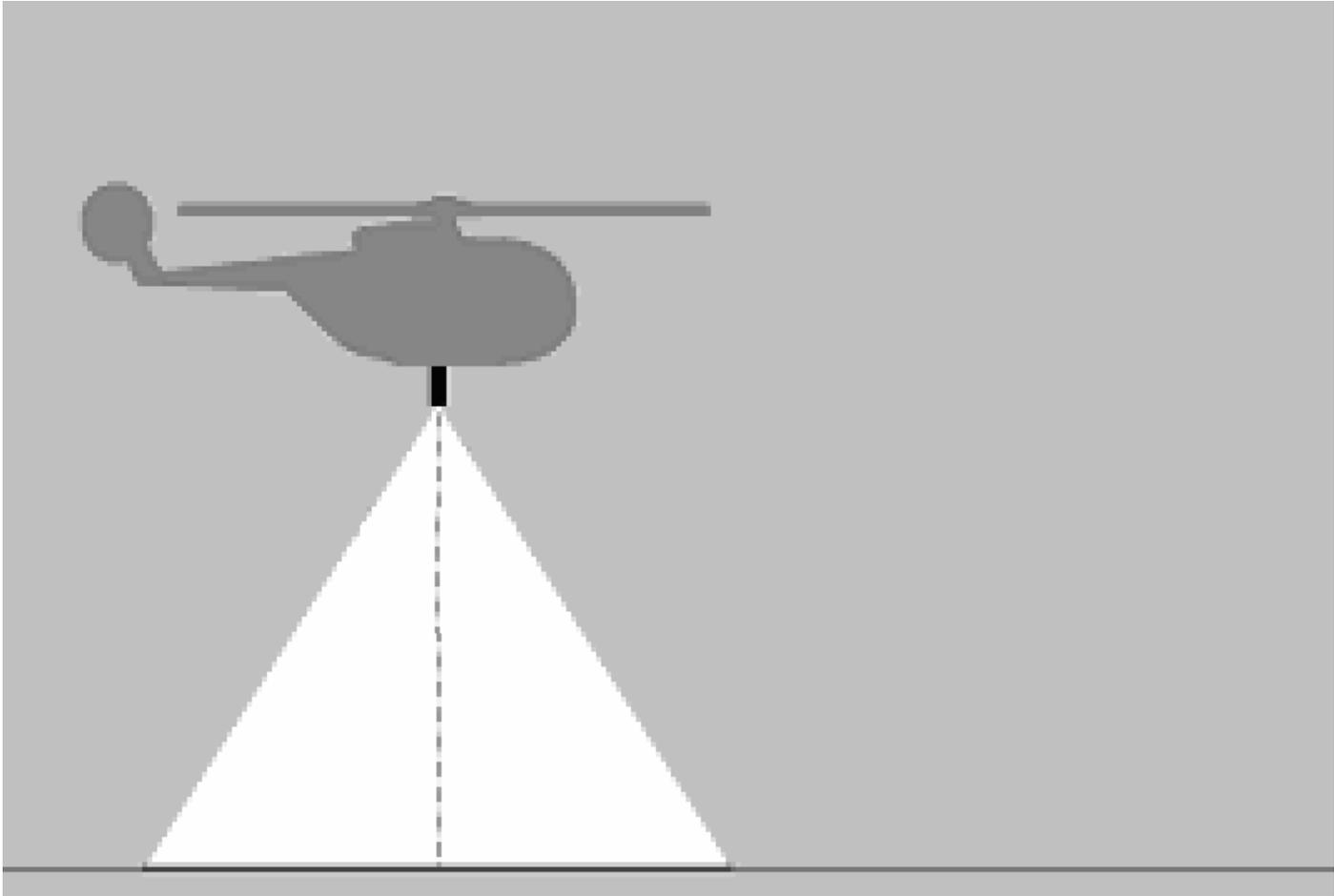


Caméra virtuelle

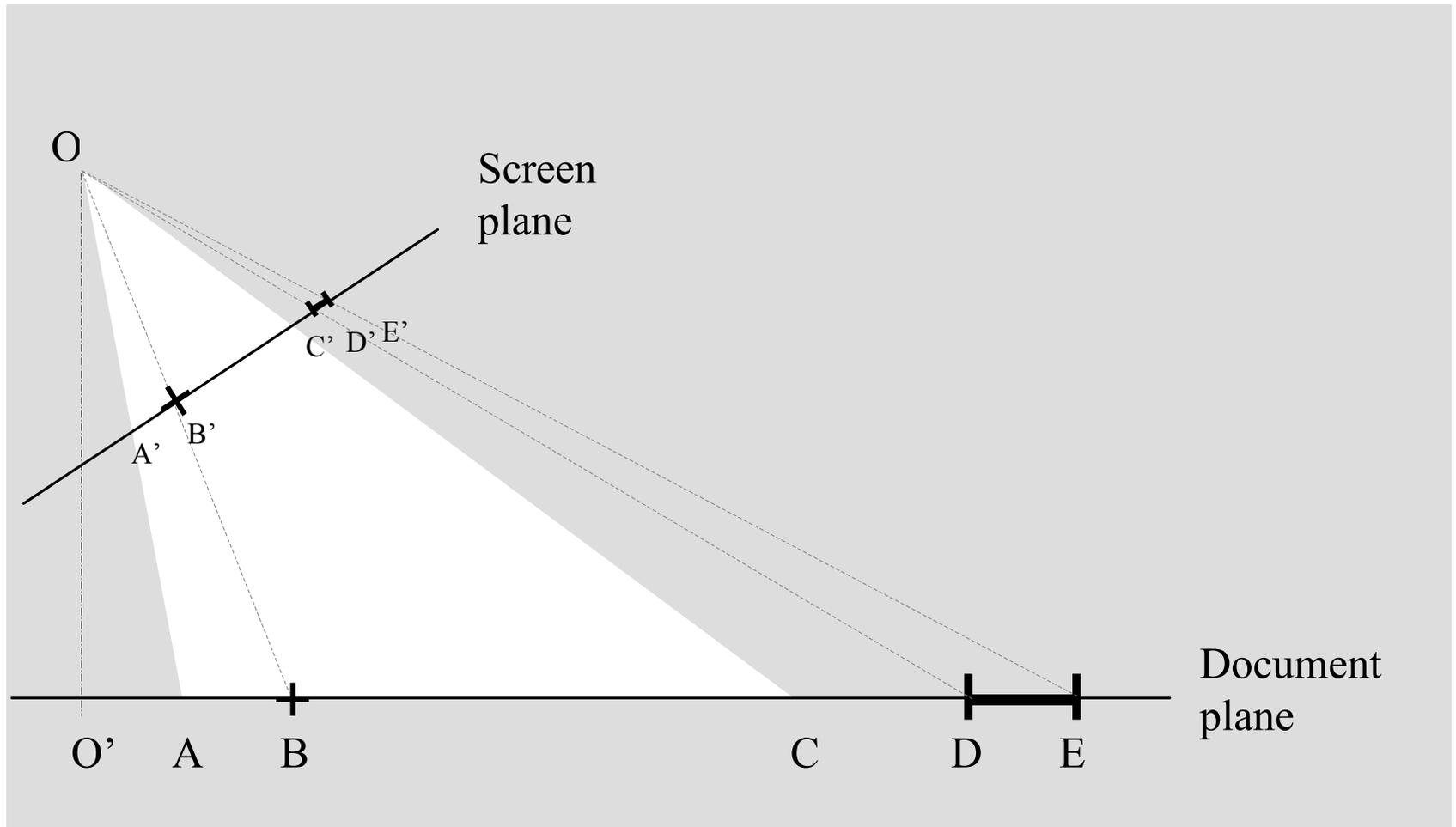
Trois degrés de liberté de translation

pas de *rotations* de la caméra

Surface du document



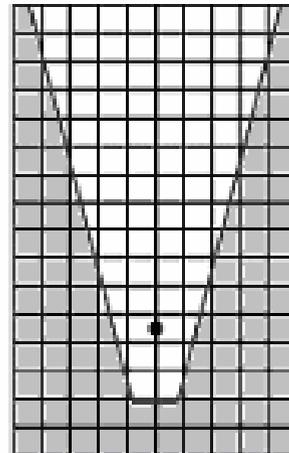
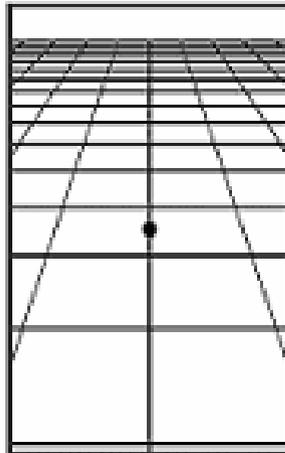
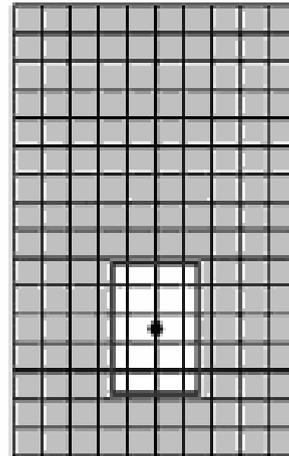
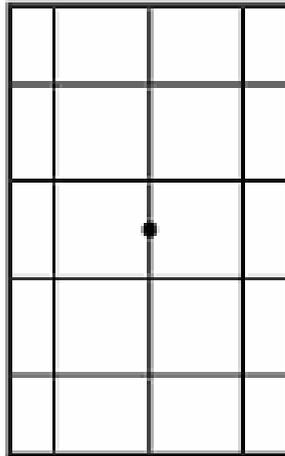
Modèle de la caméra virtuelle



Une distinction utile

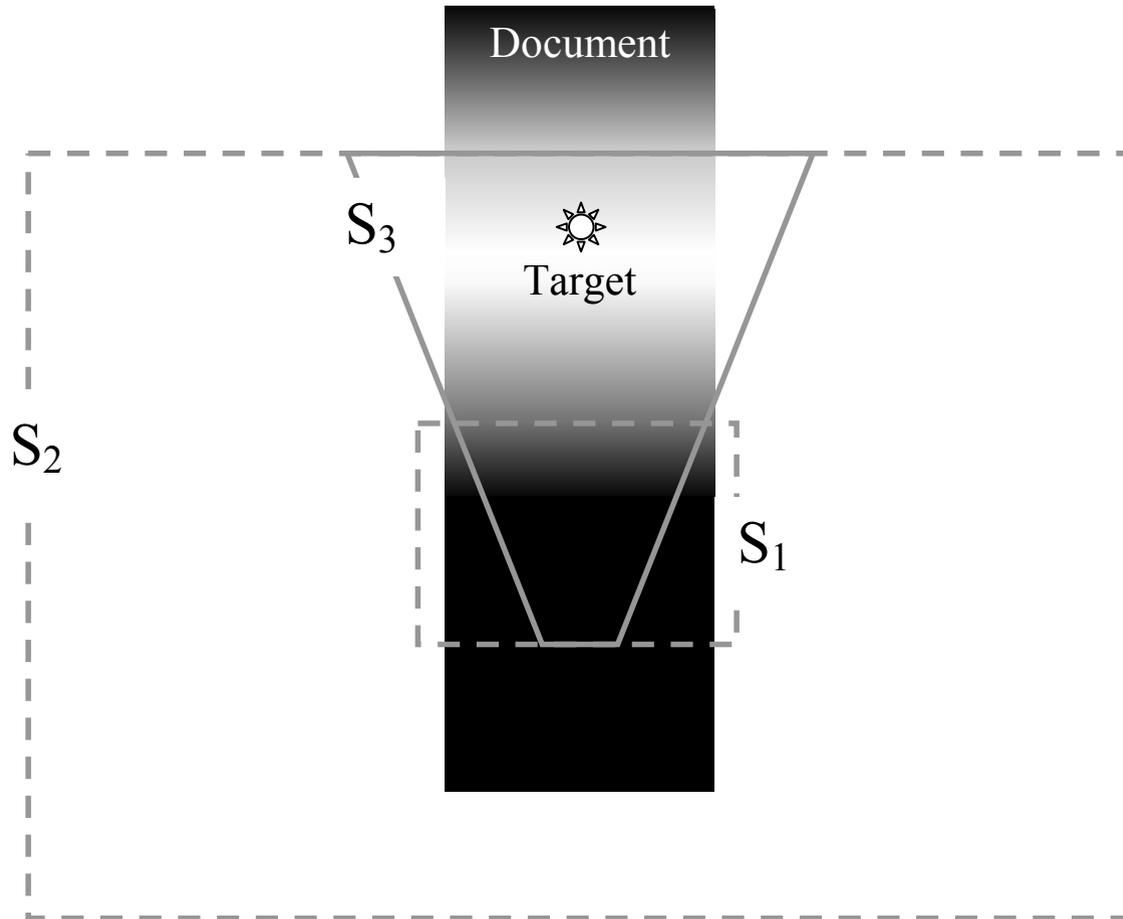
Espace de la vue

Espace du document



Limites de la technologie pan-zoom

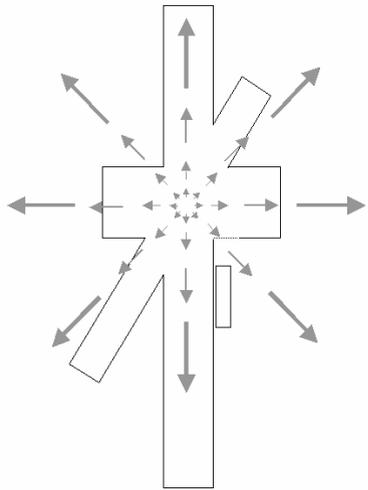
1- Exploration non-directionnelle



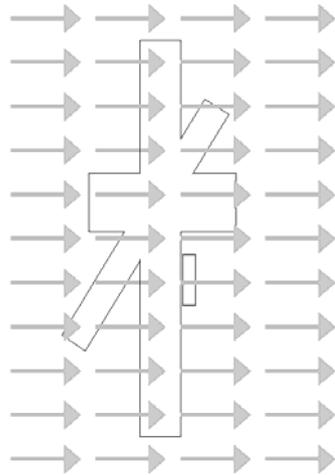
Limites de la technologie pan-zoom

2- Flux optiques : pauvreté en information *prospective*

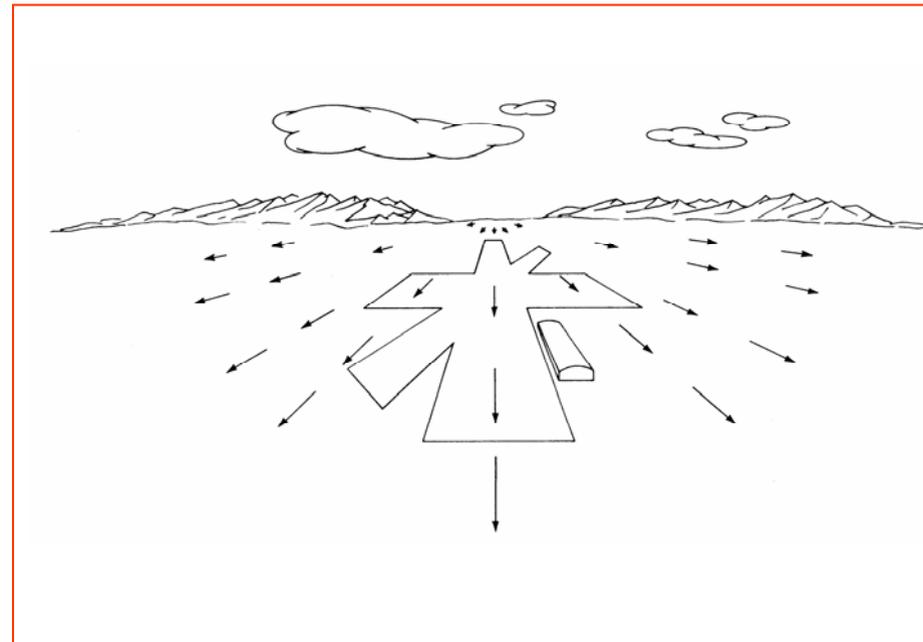
Zoom avant



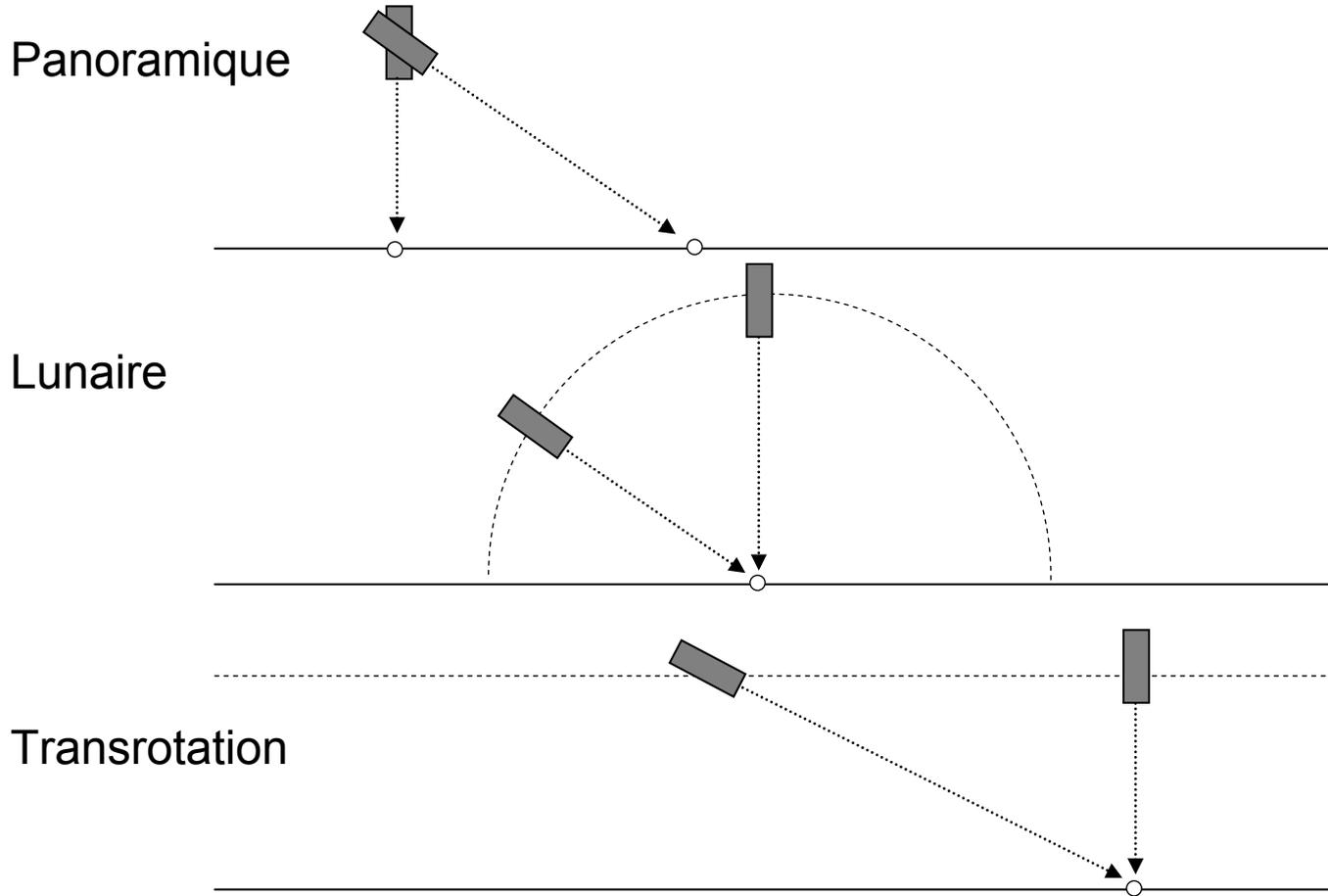
Défilement

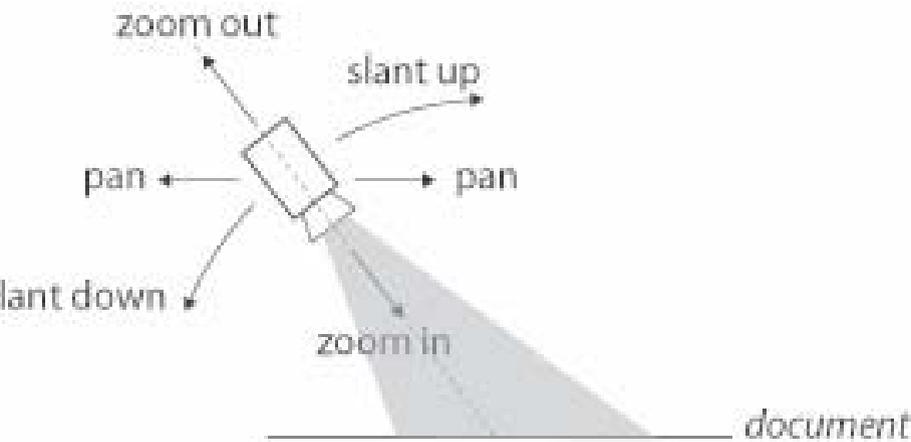


Flux obtenus par le pilote d'un avion

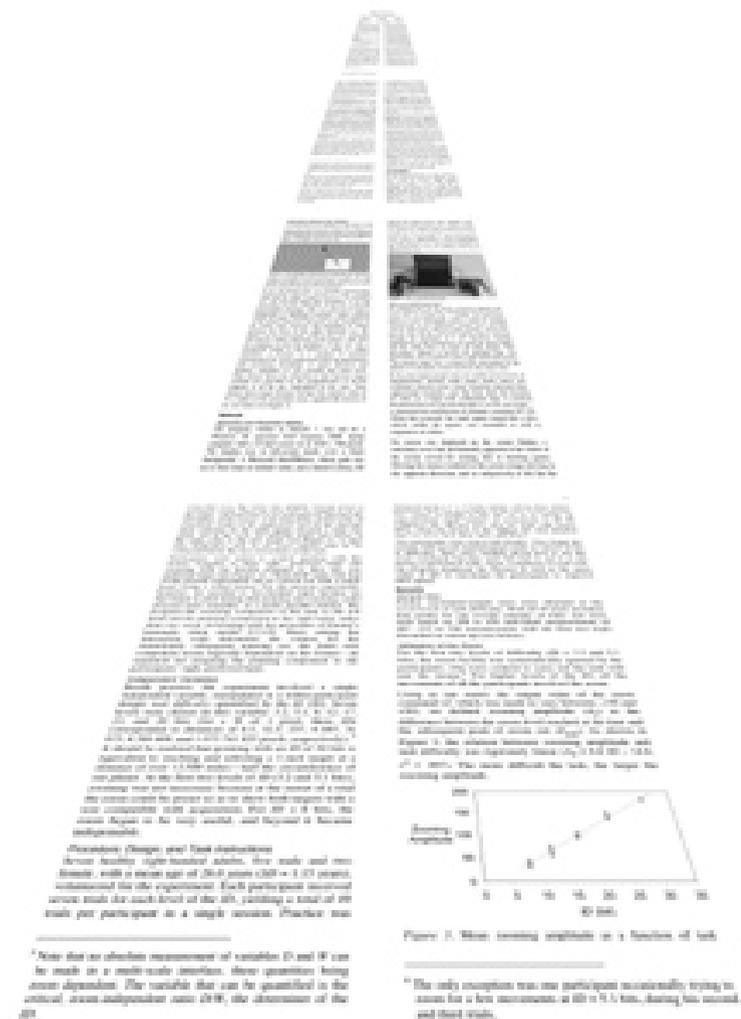


Rotations et combinaisons rotation-translation





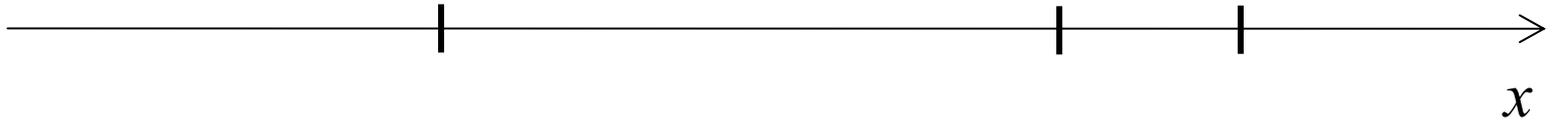
Inclinaison de la caméra virtuelle



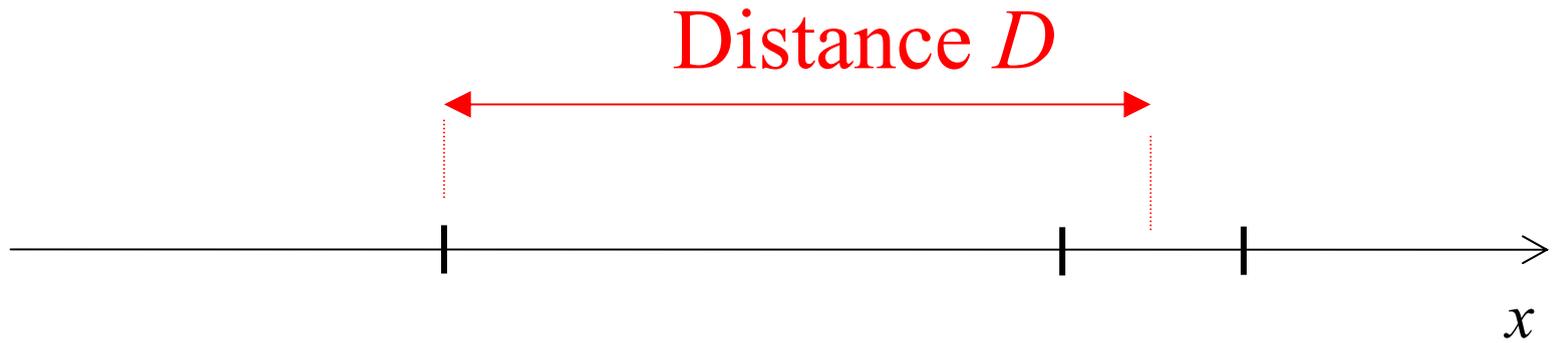
Vue en perspective

Intrinsèquement et naturellement multi-échelle

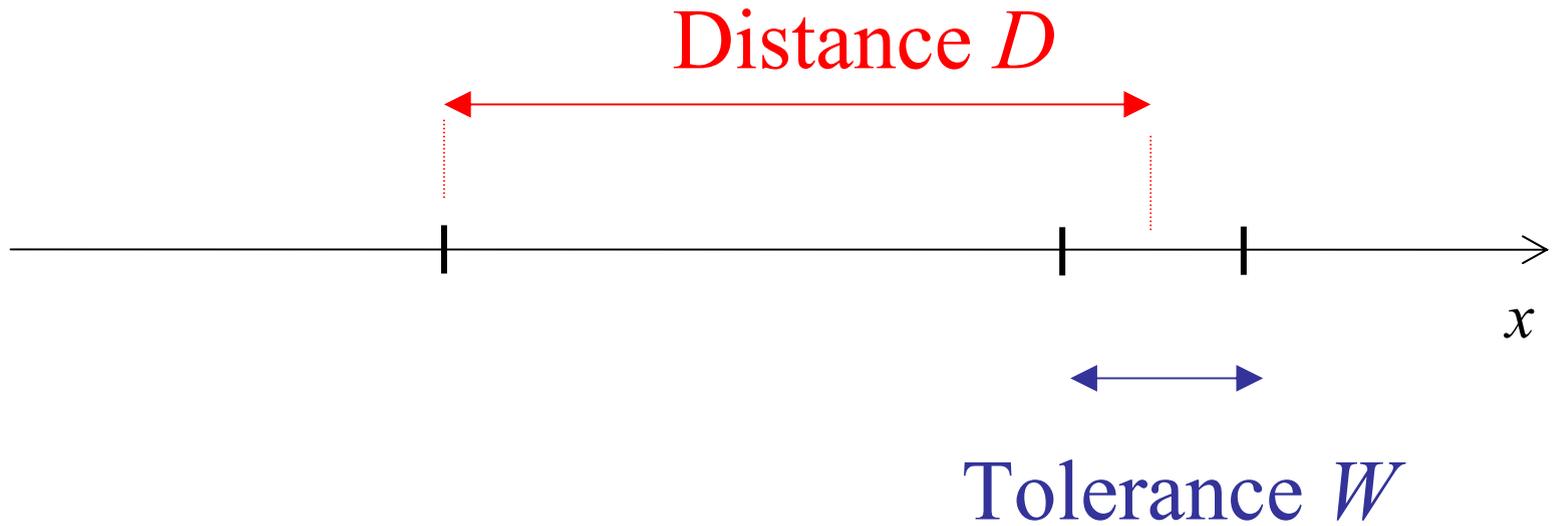
Paradigme de Fitts



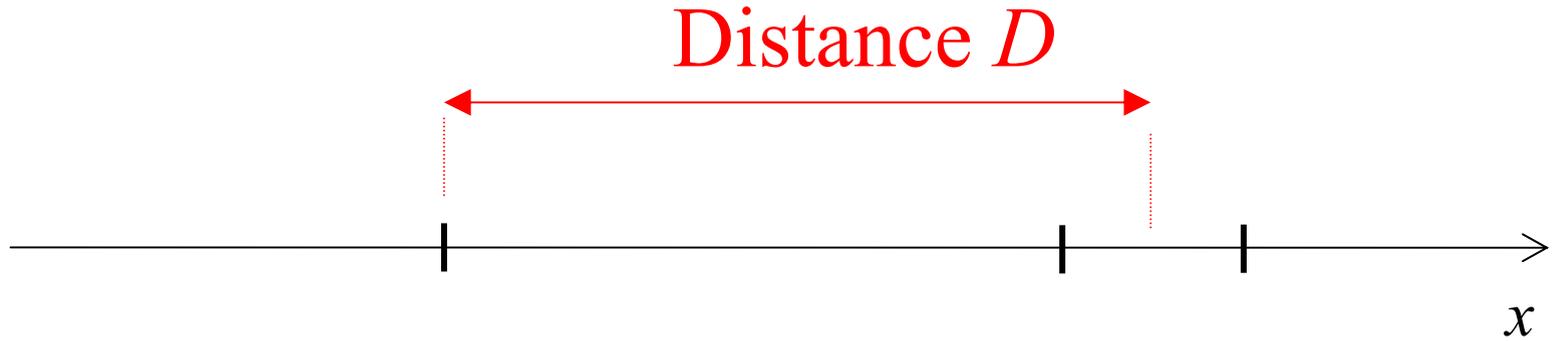
Paradigme de Fitts



Paradigme de Fitts



Paradigme de Fitts

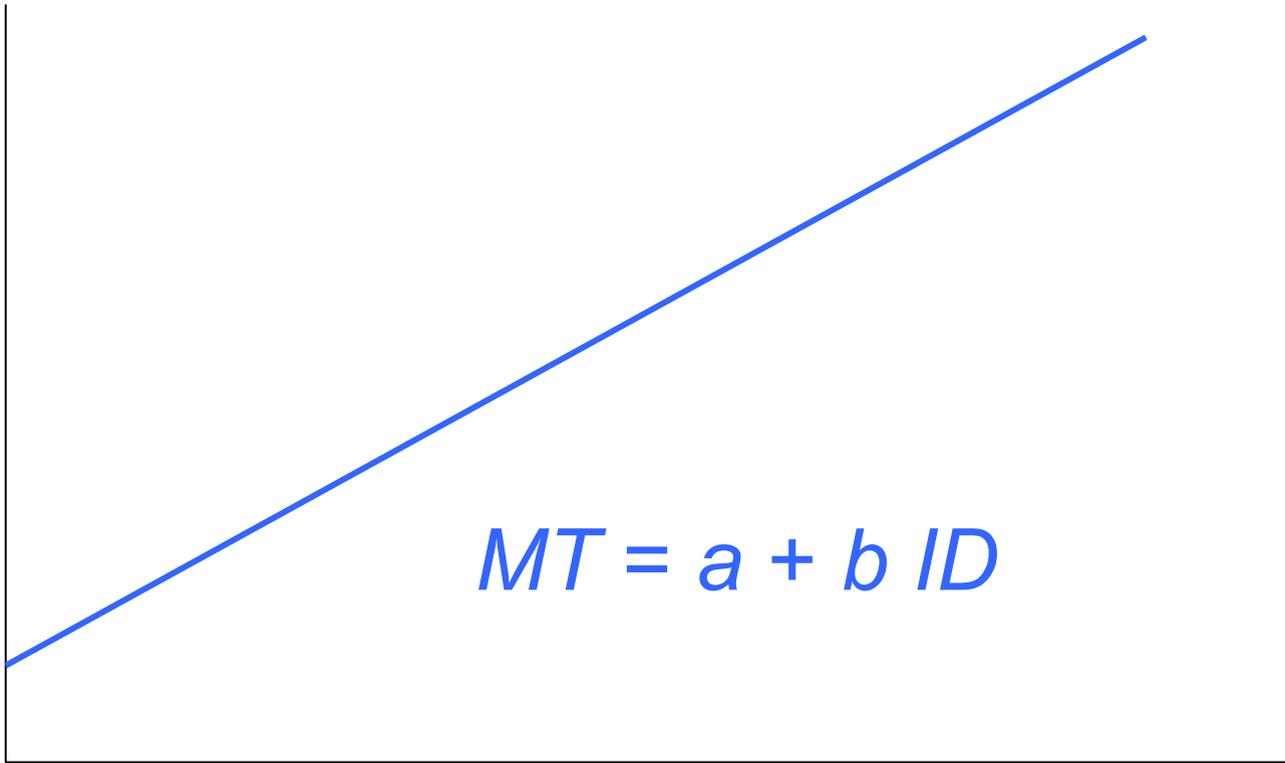


Fitts (1954): Movement
time dependent on the *ratio*
 D/W

(within scale limits)

Loi de Fitts

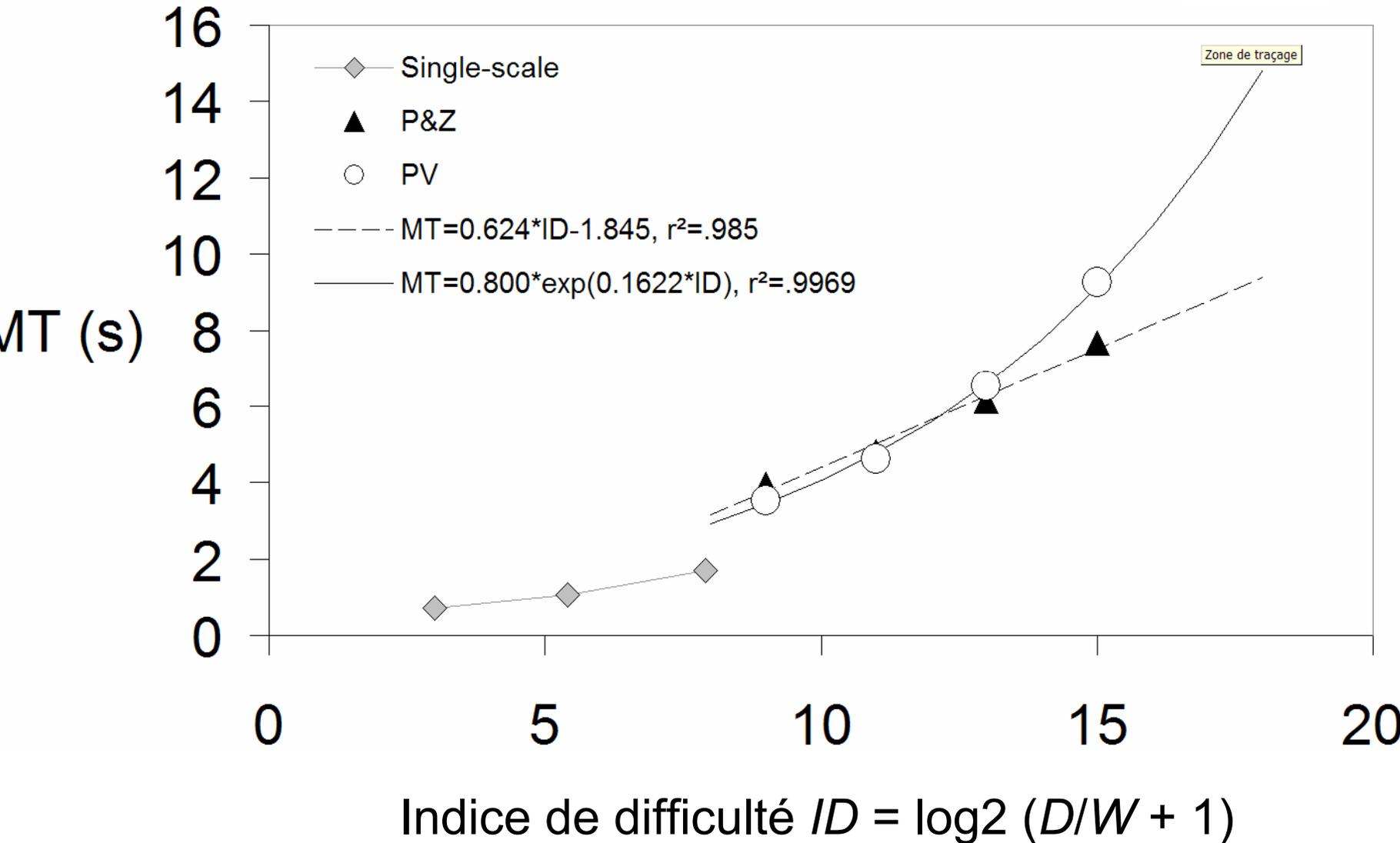
MT



$$MT = a + b ID$$

$$ID = \log_2(D/W + 1)$$

Exp. 1: Comparer PV et PZ



Exp. 2: Passer la barrière des 15 bits

