NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

(Serial No. 10/259,203)

IN RE RAVI VAIDYANATHAN

2009-1404

Appeal from the United States Patent and Trademark Office, Board of Patent Appeals and Interferences, No. 2008-2867.

Decided: May 19, 2010

BRIAN M. KOLKOWSKI, Orbital Research Inc., of Cleveland, Ohio, for appellant.

RAYMOND T. CHEN, Solicitor, Office of the Solicitor, United States Patent and Trademark Office, of Arlington, Virginia, for the Director of the United States Patent and Trademark Office. With him on the brief were BENJAMIN D.M. WOOD and NATHAN K. KELLEY, Associate Solicitors.

Before MICHEL, *Chief Judge*, NEWMAN AND DYK, *Circuit Judges*.

Opinion for the court filed by *Circuit Judge* NEWMAN.

Circuit Judge DYK concurs in the judgment.

NEWMAN, *Circuit Judge*.

Ravi Vaidyanathan ("the applicant") appeals the ruling of the Board of Patent Appeals and Interferences of the United States Patent and Trademark Office, affirming the examiner's rejection of claims 1–9 of application Serial No. 10/259,203 ("the '203 application"), on the ground of obviousness, 35 U.S.C. §103(a). The Board reversed the rejection of claims 10–11. *Ex parte Vaidyanathan*, No. 2008-2867 (B.P.A.I. March 11, 2009) ("*Board Opinion*").

For claims 1–9, we *vacate* the rejection and *remand* for further examination.

DISCUSSION

The '203 application relates to a guidance and control method for controlling munitions such as missiles or unmanned aircraft, wherein an autonomous reflex response is based on a neural network model of a biological response. The method is designed for the "endgame" stage of flight when the munition is very close to the target, at which stage the system guides and controls the munition by calculating trajectory commands using a neural network that is trained using a genetic algorithm; the neural network provides "high level" guidance commands to an autopilot, which converts those commands to signals that direct the actual movement of the munition. The system is described as achieving substantial gains in accuracy, as compared with prior systems.

The '203 specification acknowledges extensive existing knowledge concerning guided munitions, the use of autopilots in connection with these munitions, and the development of neural networks. The '203 invention contemplates that known technologies are used to bring the munition within close range of the target, at which

stage the neural network provides rapid-response trajectory commands for the final or endgame stage. The specification describes in mathematical detail a form of neural network that is modeled on the rapid neural response that is described as characteristic of the escape actions seen in cockroaches.

Claim 1, the broadest claim on appeal, is as follows:

> 1. A method of controlling a munition, vehicle or aircraft comprising the steps of:
>
> a) receiving information from sensors;
>
> b) processing the information with a neural network to obtain a desired trajectory for the munition, vehicle or aircraft to follow;
>
> c) inputting the desired trajectory and the information from internal sensor into an autopilot; and
>
> d) controlling the munition, vehicle or aircraft to fly the desired trajectory through the autopilot.

Claims 2–7 include additional limitations that are not argued separately in this appeal, although claim 3, which requires that the "neural network is trained using a genetic algorithm," is discussed. Claims 8 and 9 add the limitations that the neural network guides the munition, vehicle or aircraft "to avoid a target" (claim 8) or "to strike a target" (claim 9). Claims 10 and 11, which were allowed by the Board, add the limitations that the neural network only guides the munition "during the last less than about 1 second" before either target avoidance (claim 10) or target strike (claim 11); these claims are not part of this appeal.

The Board affirmed the examiner's rejection of claims 1, 2, and 4–9 as obvious in view of the combination of two references, U.S. Patent No. 6,473,747 ("Biggers") and No.

5,435,503 ("Johnson"). Claim 3 was rejected in view of Biggers, Johnson, and U.S. Patent No. 6,449,603 ("Hunter"). The applicant argues that these rejections were based on a misunderstanding of the Biggers and Johnson references, and lacked sufficient findings by the Board. The applicant states that the Board misinterpreted claims 8 and 9, leading the Board to conclude erroneously that the additional limitations in these claims were taught by Biggers. The applicant complains that neither the examiner nor the Board made sufficient findings or adequately explained their reasoning. The PTO, through the Solicitor on this appeal, now seeks to substitute new reasoning for that supplied by the Board concerning how the asserted references should be interpreted. The applicant attempted to respond to these new arguments in his Reply Brief.

I

The obviousness inquiry is decided as a matter of law, based on four general factual inquiries as explained in *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966), and reaffirmed in *KSR International, Inc. v. Teleflex, Inc.*, 550 U.S. 398, 406–07 (2007). The patent examiner is responsible for marshalling the references whose teachings are most relevant to the claimed invention, and evaluating the claimed invention against these teachings, from the viewpoint of a person of ordinary skill in the field of invention. *See Graham*, *supra*; *In re Kubin*, 561 F.3d 1351, 1355 (Fed. Cir. 2009); *see generally In re Oetiker*, 977 F.2d 1443, 1445–47 (Fed. Cir. 1992).

The applicant challenges the Board's legal and factual analyses. He argues that the Board committed legal error by failing to follow the Court's requirement that the factual findings on which the legal conclusion of obviousness rests should be set forth explicitly. *See KSR*, 550 U.S. at 418 ("To facilitate review, this analysis should be

made explicit."); *see also In re Gartside*, 203 F.3d 1305, 1314 (Fed. Cir. 2000) ("We have expressly held that the Board's opinion must explicate its factual conclusions, enabling us to verify readily whether those conclusions are indeed supported by 'substantial evidence' contained within the record."); *In re Grasselli*, 713 F.2d 731, 739 (Fed. Cir. 1983) ("It is fundamental that rejections under 35 U.S.C. §103 must be based on evidence comprehended by the language of that section.").

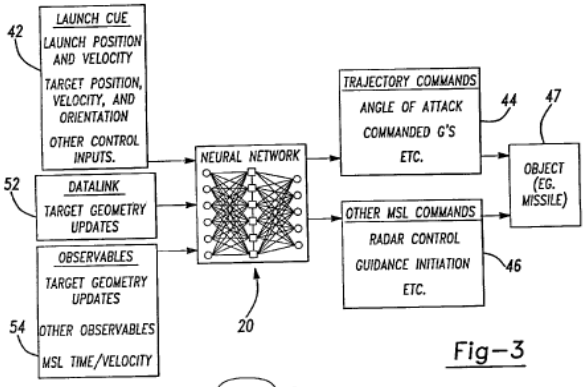
The applicant points to the Board's interpretation of the Biggers and Johnson references as examples of the Board's failure accurately to ascertain the differences between the prior art and the claimed invention, as required by *Graham*. He also states that the Board failed to establish, or even to address at all, the level of ordinary skill in the field of the invention, as required by *Graham*. He also states that the Board erred in its interpretation of claims 8 and 9, further undermining the conclusion of obviousness. He contends that these errors so infect the Board's legal analysis of obviousness that the rejections cannot stand.

A

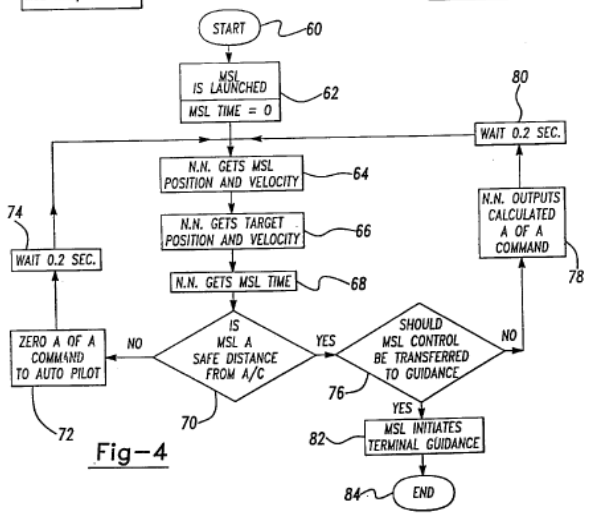
The applicant first argues that the Board's interpretation of the Biggers reference lacks support by substantial evidence. The applicant points out that the Board viewed Biggers differently than did the examiner, and that the PTO Solicitor has attempted yet a third interpretation on this appeal. We agree that the PTO has offered divergent views of what Biggers describes and means in relation to the '203 application.

Biggers is directed to the control of a guided missile using a neural network that processes information received from onboard sensors to determine desired trajectory commands. Unlike the '203 application's emphasis on the endgame stage of flight, Biggers uses the neural

network at an intermediate stage of flight, and then switches to an independent guidance control system for the late-stage approach to the target. Figures 3 and 4 of Biggers illustrate the method: Figure 3 is a "data flow diagram" showing the information received by and produced by a neural network (20), and Figure 4 is a "flowchart" depicting the sequence of steps by which the system operates:[1]



Fig–3



Fig–4

[1] In these figures "N.N." stands for neural network, "MSL" for missile, "A/C" for aircraft, and "A of A" for angle of attack.

As depicted in Figure 4, after missile launch (62) the neural network receives missile position and velocity information (64), target position and velocity information (66), and time elapsed since launch information (68). At decision block (70) the system determines whether the missile is a safe distance from the aircraft; if it is not, a zero signal is sent to the autopilot (72) and the autopilot controls flight. If so, the neural network outputs a calculated angle-of-attack command that guides the missile (78), unless, at decision block (76), it is determined that the missile is close enough to its target to be transferred to a separate guidance system (82). In that case, the neural network ceases to provide commands and the guidance system controls the missile's flight. Thus the Biggers neural network controls flight only during the intermediate stage when the missile is a safe distance away from the launching aircraft but not yet within close range of its target.

The applicant especially criticizes the Board's third Finding of Fact ("FF3"), which relates to the interplay between the neural network component and the autopilot component of the Biggers system. The Board stated:

> FF3 Biggers teaches sending angle of attack commands to the auto pilot system of the missile. Biggers, col. 4, l. 66 to col. 5, l. 2. Although flow diagram box 44 in fig. 3 of Biggers is not explicitly discussed by Biggers, a person of ordinary skill in the art would understand that box to denote the auto pilot alluded to by Biggers.

Board Opinion at 6. This finding is relevant to step (c) of claim 1 of the '203 application, where the desired trajectory calculated by the neural network in step (b) is input into an autopilot. The Board found that the trajectory or "angle of attack" commands generated by the Biggers neural network are sent to the autopilot for implementa-

tion, and thus that this aspect of step (c) is taught by Biggers. The Board did not discuss Biggers Figure 4, or the Biggers specification (apart from the cited sentence at col.4 l.66 to col.5 l.2, which makes no reference to the neural network), but cited box (44) of Figure 3 as providing implicit support for this aspect, although "not explicitly discussed." *See* FF3, *supra*. Box (44) shows "angle of attack" trajectory commands as output of the neural network, but makes no mention of an autopilot.

The Board thus recognized that the relay of trajectory commands from the neural network to the autopilot is not described explicitly in Biggers, but stated that "a person of ordinary skill in the art of missile guidance would understand that trajectory angle of attack commands, by whatever means they are produced, are transmitted to a missile auto pilot, which specifies angle changes to the missile necessary to maintain the velocity vector of the missile along the specified trajectory and transmits these changes to an alignment/control system to effect the changes." *Board Opinion* at 9–10. The Board cited no other evidence indicating the level of ordinary skill in the relevant art, or explaining why a person of ordinary skill would view this autopilot aspect as an implicit teaching of Biggers.

The applicant states that Biggers teaches the use of three independent, discrete elements or systems to guide the missile in different stages of flight. The applicant refers to the specific portions of the Biggers specification that he states describe these three distinct elements and stages: (1) an autopilot used only to maintain the initial trajectory after launch and until the missile is a safe distance from the aircraft that launched it (Biggers, col. 4 l.66 to col. 5 l.2); (2) a neural network apparatus for taking over control of the trajectory of the missile after it is a safe distance from the aircraft until it reaches a nonfinal position (*id.* col. 4 ll.13–17; col. 6 ll.43–44); and (3) a

terminal guidance system for guiding the missile from that non-final position to a final position (*id.* col. 4 ll. 15–17; col. 4 ll.35–38; col. 5 ll.14–17).

The applicant states that when it is understood that Biggers teaches these separate and independent systems for guiding the missile at different stages, it cannot reasonably be concluded that Biggers teaches that the neural network sends its trajectory commands to the autopilot. He states that Biggers only refers to the autopilot in connection with the initial stage, before the neural network begins to control flight. He argues that the Biggers specification never states that the neural network sends its commands to the autopilot, and that this path would be incompatible with the purpose of the Biggers invention. He states that Figure 3, cited by the Board, provides no support for the Board's interpretation, for it makes no mention of an autopilot, and box (44) represents information that is produced by the neural network rather than a separate autopilot component of the system. The applicant argues that the flowchart in Figure 4 clarifies the independent operation of the autopilot and the neural network at different temporal stages. He states that Figure 4 shows that the Biggers autopilot controls flight only in the initial stage, when the missile is not yet a safe distance from the launching aircraft, and that the provision of "zero A of A command" during this stage, at step (72), indicates that the autopilot does not guide flight based on information received from the neural network. In contrast, Figure 4 shows that the neural network calculates and outputs angle of attack commands in the intermediate stage when it guides flight, as indicated in step (78).

The PTO Solicitor on this appeal simply states that "substantial evidence supports the Board's finding that block 44 of Figure 3 denotes the missile's autopilot system." PTO Brief at 18. This statement is not tied to any

description within Figure 3, or any language in the specification, or any other source of "substantial evidence." Apparently recognizing this gap, the Solicitor also presents an explanation of Biggers that differs from that provided by the Board. The Solicitor now states that Biggers' Figure 4 provides support for finding that Biggers teaches the input of trajectory information produced by the neural network into an autopilot, which then controls the missile to fly the desired trajectory. Contradicting the applicant's explanation of Biggers, the PTO reasons that the "zero A of A command" sent to the autopilot in step (72) is itself a "trajectory command" provided by the neural network in the sense required by the applicant's claim 1 step (c). However, neither the Board nor the Examiner made such findings regarding step (72), and the Board's opinion states that the Board found Biggers' autopilot teaching not in Figure 4, but in block (44) of Figure 3. The PTO Solicitor now argues, for the first time, that Figure 4 is sufficient to show that commands from the neural network are input into the autopilot in at least one phase of the Biggers method.

The PTO also argues that the Johnson reference describes an autopilot that receives and implements guidance commands from a guidance function, and that this is evidence of how traditional autopilots were known to function. The Solicitor states, citing the "Background" discussion in the '203 specification, that autopilots have operated in this way for over sixty years, since the Proportional Navigation ("ProNav") algorithm for terminal stage missile guidance was introduced publicly in 1948. The Solicitor states that while the Biggers reference lacks detail in its description of the autopilot, nothing in Biggers suggests that these known autopiloting techniques were set aside, or that the autopilot plays no role in effectuating the trajectory commands calculated by the Biggers neural network. The Solicitor argues: "Because

the focus of Biggers is on what generates the guidance commands—the neural network trajectory controller—and not on how a missile converts these commands into actual course changes, it is not particularly surprising that Biggers does not discuss the autopilot in greater detail." PTO Brief at 21.

The applicant addresses these new PTO arguments in his Reply Brief. He states that Figure 4 of Biggers and the general background knowledge of autopilots do not show what the Solicitor states is shown. The applicant points out that while the Solicitor states that in Biggers "the neural network sends a zero angle of attack to the autopilot" in step (72), nothing in either Figure 4 or the accompanying description states that it is the neural network that sends this zero angle of attack. Biggers describes this step of Figure 4 as follows: "If [the missile] is not a safe distance, then block **72** is processed wherein a zero angle of attack command is sent to the auto pilot system of the missile, and subsequently block **74** is executed wherein the neural network waits a predetermined amount of time . . . ." Biggers, col.4 l.67 – col.5 l.4. The applicant contends that this description shows that the neural network does not participate in guiding flight during the initial stage. He argues that in contrast, step (78) expressly shows the role played by the neural network when it participates in flight guidance. He states that there is no evidence supporting the Solicitor's new argument that the neural network's participation is inherent at step (72).

The Solicitor states that the applicant has not explained where else the zero angle of attack in step (72) could come from, but the applicant responds that he does not bear the burden of proving what Biggers teaches. The applicant points to the conflicting views of the Examiner, the Board, and now the PTO Solicitor as indications that the Biggers reference does not present the clarity of

disclosure that the Solicitor now suggests. For example, the Examiner's Answer stated that "Biggers . . . explicitly teaches that the path from the non-final position to the final position should be calculated by the 'neural network apparatus' and should be *provided* (*or inputted*) from the neural network apparatus to the guidance system." (Emphasis in original.) The Board contradicted the Examiner, and stated "We find no teaching in Biggers that the trajectory data produced by the neural network are sent to the missile guidance system." *Board Opinion* at 6. The Board instead relied on FF3, which also departed from the Examiner's fact finding, for the Examiner had concluded that the "guidance system" of Biggers "should be reasonably understood as an autopilot system," whereas the Board viewed the autopilot and guidance systems of Biggers as separate functionalities. The PTO Solicitor now retreats from the Board's finding that Biggers teaches that the trajectory commands produced by the neural network are input into a separate autopilot function; the Solicitor instead argues that autopilot functions were well known, and that neither Biggers nor the claimed invention altered the basic understanding of autopilot functions.

Thus the PTO has now provided a third explanation of why Biggers teaches the input of trajectory commands from the neural network into the autopilot—one to which the applicant had no opportunity to respond or provide rebuttal evidence before the Board, although he has attempted to respond in his Reply Brief on this appeal. This third retooling of the PTO position, without additional development of the record, casts serious doubt upon the sufficiency of the support for any set of findings relating to the teachings of Biggers. Although the Solicitor argues that the court must defer to the PTO's latest position, the agency's contradictory findings of technological facts based on shifting perceptions of the prior art

impeach the deference normally owed to administrative findings of fact. *See Universal Camera Corp. v. NLRB*, 340 U.S. 474, 496 (1951) ("evidence supporting a conclusion may be less substantial when an impartial, experienced examiner who has observed the witnesses and lived with the case has drawn conclusions different from the Board's than when he has reached the same conclusion").

Further, the PTO's new explanation cannot of itself provide substantial evidence for the Board's findings, for our review is constrained by the facts that were developed during the Board proceeding. While the PTO Solicitor's argument is new as to what portion of Biggers provides support for the Board's findings, we have occasionally permitted the Solicitor to support the Board, on appeal to the court, by reference to additional portions of the references of record, provided that the applicant has had a fair opportunity to respond. *See In re Hedges*, 783 F.2d 1038, 1039 (Fed. Cir. 1986); *see also In re Wesslau*, 353 F.2d 238, 241 (CCPA 1965) (prior art reference should be considered in its entirety for what it fairly suggests to one skilled in the art). Nonetheless, the reviewing court must review the decision of the Board on the basis of the Board's findings, rather than on "post hoc rationalizations for agency action." *In re Hounsfield*, 699 F.2d 1320, 1324 (Fed. Cir. 1983) (quoting *Burlington Truck Lines, Inc. v. United States*, 371 U.S. 156, 168 (1962)).

We conclude, on the evidence and arguments presented, that the Board did not persuasively explain how a person of ordinary skill in the art would conclude that Biggers taught that the trajectory commands produced by the neural network are to be input into a separate autopilot function. The PTO's shifting positions do not assist in appellate review. *See In re Thrift*, 298 F.3d 1357, 1366 (Fed. Cir. 2002) (citing *SEC v. Chenery Corp.*, 332 U.S. 194, 196 (1947)) ("a reviewing court, in dealing with a determination or judgment which an administrative

agency alone is authorized to make, must judge the propriety of such action solely by the grounds invoked by the agency"). However, we are not prepared to hold that all three of the PTO's conflicting interpretations of Biggers and other teachings with respect to autopilot functionality are incorrect. We remand for further development of the record, and full reconsideration by the agency.

B

The applicant next argues that the Board erred as a matter of law by failing to make any findings at all as to some aspects of the obviousness analysis. He stresses that the Board did not establish the level of ordinary skill in the field of the invention, a necessary *Graham* factor. He acknowledges that "the absence of specific findings on the level of skill in the art does not give rise to reversible error 'where the prior art itself reflects an appropriate level and a need for testimony is not shown,'" *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (quoting *Litton Industrial Prods., Inc. v. Solid State Systems Corp.*, 775 F.2d 158, 163 (Fed Cir. 1985)), but he complains that the Board made repeated reference to what a "person of ordinary skill" would have understood or inferred, without ever explaining that level of ordinary skill or citing evidence to support these findings. As this court has observed, "Skill in the art does not act as a bridge over gaps in the substantive presentation of an obviousness case, but instead supplies an important guarantee of objectivity in the process." *Id.*

The PTO responds that the Board is not required to make express findings as to the level of ordinary skill in the field of the invention. The PTO states that reversal on this basis is appropriate only when the Board's failure to make an express finding on this factor reasonably may

have distorted the ultimate conclusion on obviousness. *See Custom Accessories, Inc. v. Jeffrey-Allan Industries, Inc.*, 807 F.2d 955, 963 (Fed. Cir. 1986) (vacating obviousness holding and remanding because the district court's failure to make specific findings on the level of ordinary skill, along with failure to address other *Graham* factors, suggested that the court had not properly applied the *Graham* analysis). The PTO argues that the applicant "has not attempted to show how the lack of an express finding influenced the Board's conclusion on obviousness, or that the prior art in the record is inadequate to demonstrate the appropriate level of skill." PTO Brief at 28.

The applicant replies that his argument is not simply that the Board failed to make express findings as to the level of skill; he states that the issue is uniquely relevant because the examiner's statements apparently reflect personal experience in the field of the invention, but are unaccompanied by explanation or reasoning. He states that the Board, like the examiner, made conclusory statements that it would have been obvious to a person of ordinary skill to select and combine certain parts of certain references; the Board's analysis of this aspect reads:

> To combine the feature of a neural network for determining the optimal trajectory as taught by Biggers with the missile guidance system of Johnson to attain the advantages of each would have been obvious to a person of ordinary skill in the art, as this would involve nothing more than the predictable use of prior art elements according to their established functions.

Board Opinion at 10. The applicant argues that to support this conclusion it is necessary to explain how the knowledge and competence of the ordinary skilled person in this field would have led to this combination of previously uncombined elements.

We agree with the Solicitor that an explicit statement of the level of ordinary skill is not always necessary in evaluating the obviousness of a new technologic advance. But whether or not stated explicitly, the perspective of a person of ordinary skill must frame the obviousness inquiry, and assertions of what such a person of ordinary skill would have found to be obvious require sufficient explanation to permit meaningful appellate review. In this case, not only the Board but also the examiner announced their conclusions of obviousness without providing any evidentiary support or reasoning for why a person of ordinary skill in the field of the invention would have deemed it obvious to select and combine various steps from different references, in the manner of the applicant. This court explained in *In re Zurko*, 258 F.3d 1379 (Fed. Cir. 2001), that the entry of the PTO into the deferential review of the Administrative Procedure Act requires the agency to provide support for its findings:

> With respect to core factual findings in a determination of patentability, . . . the Board cannot simply reach conclusions based on its own understanding or experience—or on its assessment of what would be basic knowledge or common sense. Rather, the Board must point to some concrete evidence in the record in support of these findings. To hold otherwise would render the process of appellate review for substantial evidence on the record a meaningless exercise.

Id. at 1386.

The PTO Solicitor argues that the Court in *KSR* held that a combination of elements from different prior art references is likely to be unpatentable if it would involve nothing more than "the predictable use of prior art elements according to their established functions," *KSR*, 550 U.S. at 417, and that the Board applied this reasoning to the combination of Biggers and Johnson. *KSR* also clari-

fied that recourse to "common sense," viewed through the perspective of a person of ordinary skill, is not barred in the obviousness inquiry. As the applicant states, while *KSR* relaxed some of the formalism of earlier decisions requiring a "teaching, suggestion, or motivation" to combine prior art references, it did not remove the need to anchor the analysis in explanation of how a person of ordinary skill would select and apply the teachings of the references. *See, e.g.*, *id.* at 417 ("If a person of ordinary skill can implement a predictable variation, §103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.").

The applicant complains that the Board simply reasoned from the hindsight knowledge of his successful invention; he stresses that, unlike the facts in *KSR*, the various steps that he combined were not known to be combinable, and the result of increased precision in missile guidance to the target was not previously known or predictable.

Obviousness is determined as a matter of foresight, not hindsight. *See id.* at 421 (citing *Graham*, 383 U.S. at 36). *KSR* did not free the PTO's examination process from explaining its reasoning. In making an obviousness rejection, the examiner should not rely on conclusory statements that a particular feature of the invention would have been obvious or was well known. Instead, the examiner should elaborate, discussing the evidence or reasoning that leads the examiner to such a conclusion. Generally, the examiner cites prior art references to demonstrate the state of knowledge. *See* 37 C.F.R. §1.104(c)(2) ("In rejecting claims for want of novelty or obviousness, the examiner must cite the best references at

his or her command."); Manual of Patent Examining Procedure (MPEP) §706.02 (8th ed., rev. July 2008) ("Prior art rejections should ordinarily be confined strictly to the best available art. [citing exceptions] Such rejections should be backed up by the best other art rejections available."). If it is not possible for the examiner to provide this type of information, the examiner might choose instead to provide an affidavit detailing the examiner's own personal knowledge (as a person approximating one of ordinary skill in the art) of the technology in question. *See* 37 C.F.R. §1.104(d)(2) ("When a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of such employee, and such affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons."). Where, as here, prior art references are cited to support an obviousness rejection, the references themselves need not in every case provide a "specific hint or suggestion" of the alteration needed to arrive at the claimed invention; the examiner's analysis "may include recourse to logic, judgment, and common sense available to a person of ordinary skill that do not necessarily require explication in any reference or expert opinion." *Perfect Web Techs. v. InfoUSA, Inc.*, 587 F.3d 1324, 1329 (Fed. Cir. 2009). In these cases the examiner should at least explain the logic or common sense that leads the examiner to believe the claim would have been obvious. Anything less than this results in a record that is insulated from meaningful appellate review. *Zurko*, 258 F.3d at 1386. If the examiner is able to render a claim obvious simply by saying it is so, neither the Board nor this court is capable of reviewing that determination. *See KSR*, 550 U.S. at 418, citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there

must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.").

Because there is insufficient elaboration of the examiner's or the Board's reasoning in this record, we vacate the Board's rejection of claims 1–7. We remand for redetermination of the question of obviousness. On remand, the PTO should determine obviousness based on evidence of record or on the examiner's detailed and articulated reasoning. If there is neither record evidence nor detailed examiner reasoning, the Board should not conclude that Vaidyanathan's claims are obvious.

II

The Board addressed claims 8 and 9 separately, with claim 9 agreed to be representative. Claim 9, in multiple dependent form, may be rewritten in independent form as follows:

> 9. [A method of controlling a munition, vehicle or aircraft comprising the steps of:
>
> a) receiving information from sensors;
>
> b) processing the information with a neural network to obtain a desired trajectory for the munition, vehicle or aircraft to follow;
>
> c) inputting the desired trajectory and the information from internal sensor into an autopilot; and
>
> d) controlling the munition, vehicle or aircraft to fly the desired trajectory through the autopilot;
>
> wherein the information is received from external and internal sensors;
>
> wherein the external sensor information is information related to a target position;

> wherein the neural network determines a desired trajectory for the munition, vehicle or aircraft; and]
>
> wherein the neural network is guiding the munition, vehicle or aircraft to strike a target.

The Board found that "Biggers does not teach using the neural network to guide the missile all the way to intercept." However, the Board concluded that the "to strike a target" limitation does not adequately distinguish claim 9 from Biggers because it does not require that the neural network guide the missile or munition all the way to "intercept," but instead merely requires that the neural network guide the munition "to strike a target." The Board viewed the words "to strike a target" as a recitation of intended purpose, rather than a step of a claimed method. On this view, the Board held that because the purpose in Biggers is also a target strike, Biggers teaches this limitation and thus describes the same method as claim 9. The Board stated: "In guiding the missile toward the target to the optimum point in space where the missile guidance system can take control and guide the missile 47 to intercept the target (FF1), the neural network in the method taught by Biggers guides the missile to strike a target." *Board Opinion* at 11.

The applicant argues that claim 9, when properly construed in light of the specification, requires actual participation by the neural network until the point of intercept, unlike the Biggers method. He argues that the Board misconstrued the "to strike a target" limitation of claim 9, and thereby misapplied Biggers. The applicant states that the '203 application describes for the first time the use of a neural network in connection with the final stage of flight leading to intercept, whereas Biggers describes the use of a neural network only at an intermediate stage,

to be replaced by a different terminal guidance system before intercept.

The PTO Solicitor responds that the broadest reasonable claim interpretation that is supported by the specification is adopted during examination, for the claims can readily be amended during examination, to impart precision if needed. We agree with this protocol as an examination expedient, for its purpose is to aid in sharpening the claims in order to avoid ambiguity or uncertainty in the issued patent. *See e.g.*, *In re Skvorecz*, 580 F.3d 1262, 1267 (Fed. Cir. 2009); *In re Buszard*, 504 F.3d 1364, 1366–67 (Fed. Cir. 2007); *In re Prater*, 415 F.2d 1393, 1396 (CCPA 1969). However, the PTO's "broadest" interpretation must be reasonable, and must be in conformity with the invention as described in the specification.

The Board's interpretation of claim 9 finds no support in the '203 specification, and is not a reasonable interpretation under the rules of claim construction. The description in the specification consistently indicates that the neural network guides the munition all the way intercept. The '203 specification uses the word "strike" synonymously with "intercept," foreclosing the divergent meanings the Board seeks to attach to these terms. The Board's rejection of claims 8 and 9 was based on an incorrect interpretation of these claims. That rejection is vacated and remanded for reconsideration under the correct interpretation of the claims, and in further view of the issues with respect to obviousness as discussed in connection with claims 1–7.

III

Both sides have raised additional arguments, for example with respect to the impact of the Johnson reference on the "sensor" aspect of step 1(c). In view of our remand for further prosecution of claims 1–9, we need not reach the additional issues, for none appears to be dispositive of

either allowance or rejection.[2] They may be considered on remand if relevant to the issues.

VACATED AND REMANDED

DYK, *Circuit Judge*, concurs in the judgment.

[2] In its Statement of Facts, the PTO points out that the appealed claims do not limit the '203 application's invention to a specific use of a neural network based on the specific reflex response that is the primary matter described in the specification, and thus suggests that the appealed claims are too broadly drawn to distinguish the invention from the combination of Biggers and Johnson. This aspect may warrant attention on remand.