United States Court of Appeals for the Federal Circuit

KONINKLIJKE KPN N.V.,
Plaintiff-Appellant

v.

GEMALTO M2M GMBH, GEMALTO INC., GEMALTO IOT LLC, TCL COMMUNICATION TECHNOLOGY HOLDINGS LIMITED, TCL COMMUNICATION, INC., TCT MOBILE (US) HOLDINGS, INC., TCT MOBILE (US) INC., TCT MOBILE, INC., TELIT WIRELESS SOLUTIONS, INC.,
Defendants-Appellees

LG ELECTRONICS, INC.,
Intervenor

2018-1863, 2018-1864, 2018-1865

Appeals from the United States District Court for the District of Delaware in Nos. 1:17-cv-00086-LPS, 1:17-cv-00091-LPS, 1:17-cv-00092-LPS, Chief Judge Leonard P. Stark.

Decided: November 15, 2019

ANDRES HEALY, Susman Godfrey LLP, Seattle, WA, argued for plaintiff-appellant. Also represented by HUNTER

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BRIAN ROSENTHAL, Gibson, Dunn & Crutcher LLP, New York, NY, argued for all defendants-appellees and intervenor. Defendants-appellees Gemalto M2M GmbH, Gemalto Inc., Gemalto IOT LLC, also represented by BRIAN ANDREA, Washington, DC.

WILLIAM R. PETERSON, Morgan, Lewis & Bockius LLP, Houston, TX, for defendants-appellees TCL Communication Technology Holdings Limited, TCL Communication, Inc., TCT Mobile (US) Holdings, Inc., TCT Mobile (US) Inc., TCT Mobile, Inc. Also represented by JULIE S. GOLDEMBERG, Philadelphia, PA; BRADFORD CANGRO, HANG ZHENG, Washington, DC.

DAVID A. LOEWENSTEIN, Pearl Cohen Zedek Latzer LLP, New York, NY, for defendant-appellee Telit Wireless Solutions, Inc. Also represented by CLYDE SHUMAN, GUY YONAY.

CARTER GLASGOW PHILLIPS, Sidley Austin LLP, Washington, DC, for intervenor. Also represented by RYAN C. MORRIS; PETER H. KANG, Palo Alto, CA.

Before DYK, CHEN, and STOLL, *Circuit Judges*.

CHEN, *Circuit Judge*.

Plaintiff-Appellant Koninklijke KPN N.V. (KPN) owns U.S. Patent No. 6,212,662 ('662 patent). KPN sued Gemalto M2M GmbH, Gemalto Inc., Gemalto IOT LLC, TCL Communication Technology Holdings Limited, TCL Communication, Inc., TCT Mobile, Inc., TCT Mobile (US) Inc., TCT Mobile (US) Holdings, Inc., and Telit Wireless

Solutions, Inc. (collectively "Appellees") for infringement of the '662 patent in the United States District Court for the District of Delaware. Appellees moved for judgment on the pleadings under Federal Rule of Civil Procedure 12(c) alleging that all four claims (claims 1–4) of the '662 patent were ineligible under 35 U.S.C. § 101. The district court granted Appellees' motion with respect to all four claims, concluding that the claims recite no more than mere abstract data manipulation operations, such as "reordering data and generating additional data." J.A. 23. On appeal, KPN only challenges the district court's ineligibility decision with respect to dependent claims 2–4. As to these appealed claims, we reverse. Rather than being merely directed to the abstract idea of data manipulation, these claims are directed to an improved check data generating device that enables a data transmission error detection system to detect a specific type of error that prior art systems could not.

In data transmission systems, it is common to generate something called "check data" to check whether data was accurately transmitted over a communications channel. Check data is generated based on the original data and thus serves as a shorthand representation of a particular block of data. By comparing the check data generated at both ends of the communication channel, error detection systems may be able to infer whether errors occurred during transmission. For example, if the check data from both ends match, the system infers that the content of the received data block is the same as what was transmitted and thus concludes that no errors occurred during transport.

But, as the '662 patent recognizes, matching check data is not always a reliable indicator of accurate data transmissions. According to the patent, certain generating functions coincidentally produce the same check data for a corrupted data block and an uncorrupted data block. When this happens, the check data is functionally defective, because the system will mistakenly believe that there were

no errors in the data transmission. The problem of defective check data is aggravated for a particular type of persistent error, i.e., "systematic error," that repeats across data blocks in the same way. According to the '662 patent, prior art error detection systems were unable to reliably detect systematic errors. Once the prior art system generated defective check data for an initial data block with a given systematic error, the system would continue to generate defective check data for subsequent data blocks with the same systematic error, thus allowing these types of errors to persist in the system.

The '662 patent solves this problem by varying the way check data is generated by varying the permutation applied to different data blocks. Varying the permutation for each data block reduces the chances that the same systematic error will produce the same defective check data across different data blocks. Claims 2–4 thus replace the prior art check data generator with an improved, dynamic check data generator that enables increased detection of systematic errors that recur across a series of transmitted data blocks. As with other claims we have found to be patent-eligible in prior cases, the appealed claims represent a non-abstract improvement in the functionality of an existing technological process and not simply an abstract idea of manipulating data. Accordingly, we reverse the district court's grant of Appellees' Rule 12(c) motion that claims 2–4 are ineligible on the pleadings.

TECHNOLOGY BACKGROUND

In order to physically transmit information over the air from a transmitter to a receiver, that information is encoded as a series of electromagnetic pulses representing "0s" and "1s" of binary code, packaged into a series of individual data blocks. As the information travels through the air, different types of environmental factors may impact the transmission of data in different ways. Whereas variable changes in the environment may cause random errors

to appear in different data blocks, persistent properties in the environment, such as an "interference signal with a certain frequency" or "equipment error," may cause certain errors to repeat themselves across each data block in the same way. '662 patent at col. 1, ll. 48–52. This type of persistent error, called a "systematic error," is the focus of the '662 patent.

A. Prior Art Check Data Generators

Conventional prior art systems detected errors in data transmissions by generating something called "check data" (or "supplementary data"). *Id.* at col. 1, ll. 10–46, col. 3, ll. 32–33. Check data is a short piece of information that is generated from the original data using a generating function. *Id.* at col. 1, ll. 55–56, col. 2, ll. 31–34. As such, check data effectively serves as a short-hand representation of the content of the original data prior to transmission. During a data transmission, check data is attached to the original data of each data block as a "redundant" piece of information to enable the detection of transmission errors by the receiver. *Id.* at col. 1, ll. 34–37. Since a receiver cannot easily tell whether a received transmission has been corrupted by looking at the data directly, it uses the appended check data as a reference point for determining whether errors were introduced during transport. *See id.* at col. 1, ll. 37–46. To do so, the receiver compares the appended check data generated based on the original data (which we refer to as "d1") with the check data generated based on the received transmission (which we refer to as "d2"). *Id.* at col. 3, ll. 39–41. If check data d1 does not match check data d2, the receiver infers that the data used to generate check data d2 has changed during transmission from the uncorrupted data used to generate check data d1. *Id.* at col. 3, ll. 43–46. This means that errors were introduced into the original data during transmission. *Id.* However, if check data d1 matches check data d2, the system infers that there were no errors. *Id.* at col. 3, ll. 41–43.

But a match in check data does not necessarily mean that the original data was accurately transmitted. As noted by the '662 patent, "there is always a probability that erroneous data are considered to be correct data because the [check] data may be correct by coincidence." *Id.* at col. 1, ll. 52–55. That is because check data is "restricted in length and therefore a finite number of [check] data can be distinguished." *Id.* at col. 1, ll. 55–57. As a result, the same check data may be generated for a transmission with errors and another transmission without. This problem of defective check data is aggravated for a particular type of error called a "systematic error." Unlike random errors, systematic errors are "errors that repeat themselves" due to a persistent property in the channel, such as an "interference signal with a certain frequency" or "equipment error." *Id.* at col. 1, ll. 48–52. According to the '662 patent, prior art methods did not reliably detect systematic errors, which "may result in all decompressed data becoming unusable." *Id.* at col. 1, ll. 47–48, col. 2, ll. 12–16.

B. Solution of the '662 Patent

The inventors of the '662 patent recognized that the reason why systematic errors were able to persist undetected was because the prior art used the same, or "fixed," generating function to process every block of data. *Id.* at col. 2, ll. 48–50. If a fixed generating function produced defective check data for a transmission that was corrupted with a given systematic error (e.g., first and fourth bit is erroneous in every data transmission), that fixed generating function would likely continue to produce the same defective check data every time that systematic error appeared. As a result, a "[systematic] error once not recognized as such, [wa]s continually not detected." *Id.* at col. 1, ll. 57–59.

To solve the problem of undetected systematic errors in the prior art systems, the inventors of the '662 patent developed a method that varies the way check data is generated from time to time so that the same defective check

data does not continue to be produced for the same type of persistent systematic error. *Id.* at col. 2, ll. 42–47. This way, "a variable checking function can almost always prevent the non-detection of repetitive errors." *Id.* at col. 2, ll. 51–53.

The '662 patent discusses different ways of varying the way check data is generated to achieve this increased detection capability. One way is by varying the generating function used to produce the check data. For example, "[i]t is possible to vary the function completely for every n bits" by "loading a new algorithm (function f)." *Id.* at col. 4, ll. 56–57. Another way to vary the generated check data is to vary the original data before it is fed into the generating device. The '662 patent discusses different ways to accomplish this. In one embodiment, a "random number generator" is used that "adds random numbers to the user data." *Id.* at col. 3, l. 66 – col. 4, l. 2. In another embodiment, the original data is varied through "permutation," which "interchange[s] the bit position in a data block." *Id.* at col. 5, ll. 60–61. One example of a permutation may involve the following: "bit 1 to position 2, bit 2 to position 4, bit 3 to position 1 and bit 4 to position 3." *Id.* at col. 5, ll. 60–63. Based on this permutation, a data block of "1100" would transform into "0101."

The appealed claims are limited to this last embodiment. Given that they all incorporate independent claim 1, all four claims of the '662 patent are reproduced below.

> 1. A device for producing error checking based on original data provided in blocks with each block having plural bits in a particular ordered sequence, comprising:
>
> a generating device configured to generate check data; and

> a varying device configured to vary original data prior to supplying said original data to the generating device as varied data;
>
> wherein said varying device includes a permutating device configured to perform a permutation of bit position relative to said particular ordered sequence for at least some of the bits in each of said blocks making up said original data without reordering any blocks of original data.

2. The device according to claim 1, wherein the varying device is further configured to *modify* the permutation *in time*.

3. The device according to claim 2, wherein the varying is further configured to modify the permutation based on the original data.

4. The device according to claim 3, wherein the permutating device includes a table in which subsequent permutations are stored.

Id. at claims 1–4 (emphases added).

As recited above, the device of claim 2 varies the way check data is generated by applying a different *permutation* to different data blocks. Claim 3, which depends from claim 2, further recites how the permutation is modified (i.e., "based on the original data"). Claim 4, which depends from claim 3, even further specifies that different permutations are stored in a table. By varying the original data supplied to the check data generator in different ways, the device of the appealed claims significantly decreases the likelihood that defective check data will be generated for successive data blocks such that a given systematic error would continue to escape detection. *See id.* at col. 2, ll. 42–47.

DISTRICT COURT'S INELIGIBILITY DECISION

The district court granted Appellees' motion for judgment on the pleadings under Rule 12(c) alleging that all four claims (claims 1–4) of the '662 patent are ineligible under § 101. J.A. 9. Applying the two-step framework laid out in *Alice Corp. v. CLS Bank International*, 573 U.S. 208 (2014), the district court found all claims of the '662 patent to be ineligible because they are directed to an abstract idea and contain no saving inventive concept. Though KPN now appeals the ineligibility decision only for dependent claims 2–4, the focus of the district court's analysis was on independent claim 1.

At step one of *Alice*, the district court found that the claims were directed to the "abstract idea of reordering data and generating additional data," likening the asserted claims to data manipulation claims found ineligible in *Two-Way Media Ltd. v. Comcast Cable Communications, LLC*, 874 F.3d 1329 (Fed. Cir. 2017), *RecogniCorp, LLC v. Nintendo Co.*, 855 F.3d 1322 (Fed. Cir. 2017), *Intellectual Ventures I LLC v. Capital One Financial Corp.*, 850 F.3d 1332 (Fed. Cir. 2017) ("*Intellectual Ventures*"), and *Digitech Image Technologies, LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344 (Fed. Cir. 2014). J.A. 23. Based on these cases, the district court explained that the claims of the '662 patent are abstract because they do "not say how data is reordered, how to use reordered data, how to generate additional data, how to use additional data, or even that any data is transmitted." J.A. 8. The district court repeated a similar concern for the dependent claims, explaining that they do "not say how the permutations are modified in time or modified based on the data." J.A. 24.

At step two of *Alice*, the district court entertained the possibility that patent-eligible subject matter is recited in the specification, but ultimately concluded that the claims are ineligible because KPN's "purported inventive concept

[was] *not captured in the claims*." J.A. 26–27 (emphasis in original).

KPN timely appealed the district court's ineligibility decision with respect to dependent claims 2–4, not independent claim 1.[1] We have jurisdiction under 28 U.S.C. § 1295(a)(1).

STANDARD OF REVIEW

We review the district court's grant of judgment on the pleadings under Rule 12(c) by following the procedural law of the regional circuit. *Allergan, Inc. v. Athena Cosmetics, Inc.*, 640 F.3d 1377, 1380 (Fed. Cir. 2011). Under Third Circuit law, we have "plenary review" of the district court's order dismissing KPN's claims pursuant to Rule 12. *Green v. Fund Asset Mgmt., L.P.*, 245 F.3d 214, 220 (3d Cir. 2001). Under this standard, we must "view the facts presented in the pleadings and the inferences to be drawn therefrom in the light most favorable to the . . . non-moving party" (KPN) and "affirm the [d]istrict [c]ourt's judgment only if the plaintiffs would not be entitled to relief under any set of facts that could be proved." *Id.*

Patent eligibility under § 101 is a question of law that may contain underlying issues of fact. *Interval Licensing LLC v. AOL, Inc.*, 896 F.3d 1335, 1342 (Fed. Cir. 2018) (citing *Berkheimer v. HP Inc.*, 881 F.3d 1360, 1365 (Fed. Cir. 2018)). We review an ultimate conclusion on patent eligibility de novo. *Id.*

DISCUSSION

Section 101 defines patent-eligible subject matter as "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement

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[1] KPN states that it "statutorily disclaimed Claim 1 for reasons unrelated to this appeal." Appellant's Br. at 15 n.5.

thereof." 35 U.S.C. § 101. Laws of nature, natural phenomena, and abstract ideas, however, are not patentable. *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 70–71 (2012). These categories of subject matter have been excluded from patent-eligibility because they represent "the basic tools of scientific and technological work." *Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576, 589 (2013). The "concern that drives this exclusionary principle [is] one of pre-emption." *Alice*, 573 U.S. at 216. To determine whether claimed subject matter is patent-eligible, we apply the two-step framework explained in *Alice*, *id.* at 218. First, we "determine whether the claims at issue are directed to a patent-ineligible concept" such as an abstract idea. *Id.* Second, if so, we "examine the elements of the claim to determine whether it contains an 'inventive concept' sufficient to 'transform' the claimed abstract idea into a patent-eligible application." *Id.* at 221 (quoting *Mayo*, 566 U.S. at 72, 80).

At step one of the *Alice* framework, we "look at the focus of the claimed advance over the prior art to determine if the claim's character as a whole is directed to excluded subject matter." *Affinity Labs of Tex., LLC v. DIRECTV, LLC*, 838 F.3d 1253, 1257 (Fed. Cir. 2016) (internal quotation marks omitted). "In cases involving software innovations, this inquiry often turns on whether the claims focus on 'the specific asserted improvement in computer capabilities . . . or, instead, on a process that qualifies as an abstract idea for which computers are invoked merely as a tool.'" *Finjan, Inc. v. Blue Coat System, Inc.*, 879 F.3d 1299, 1303 (Fed. Cir. 2018) (quoting *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1335–36 (Fed. Cir. 2016) (internal quotation marks omitted)). Since *Alice*, we have found software inventions to be patent-eligible where they have made non-abstract improvements to existing technological processes and computer technology. *See McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1313–16 (Fed. Cir. 2016) (claims directed to a process for lip-

synching animated characters that used specific rules to automate a previously subjective manual process); *Enfish*, 822 F.3d at 1337–39 (claims directed to a self-referential database that improved the way computers stored and retrieved data in memory); *Finjan*, 879 F.3d at 1304–06 (claims directed to generating a security profile that improved the ability of a computer system to identify potentially suspicious operations that it could not previously identify before); *Ancora Techs. Inc. v. HTC America Inc.*, 908 F.3d 1343, 1347–49 (Fed. Cir. 2018) (claims directed to storing a verification structure in a part of computer memory that is less vulnerable to hacking to improve security against unauthorized use of licensed software).

An improved result, without more stated in the claim, is not enough to confer eligibility to an otherwise abstract idea. *Finjan*, 879 F.3d at 1305 (stating that as a "foundational patent law principle," "a result, even an innovative result, is not itself patentable"). To be patent-eligible, the claims must recite a specific means or method that solves a problem in an existing technological process. *Compare Affinity Labs*, 838 F.3d at 1258 (finding claims related to wirelessly communicating regional broadcast content were directed to an ineligible abstract idea because "nothing in claim 1 . . . is directed to how to implement out-of-region broadcasting on a cellular telephone"), *and Intellectual Ventures I LLC v. Symantec Corp.*, 838 F.3d 1307, 1316 (Fed. Cir. 2016) (finding claims related to email filtering were directed to an ineligible abstract idea where there was "no restriction on how the result is accomplished" and the "mechanism . . . is not described"), *with McRO*, 837 F.3d at 1307, 1313–14 (finding claims to be directed to a patent-eligible non-abstract improvement in an existing technological process because the claims recited "specific" rules that allowed automation of a previously manual process of lip synching three-dimensional animated characters).

In accordance with the above precedents, we conclude that appealed claims 2–4 of the '662 patent are patent-

eligible because they are directed to a non-abstract improvement in an existing technological process (i.e., error checking in data transmissions). By requiring that the permutation applied to original data be modified "in time," claim 2, which is incorporated into all appealed claims, recites a specific implementation of varying the way check data is generated that improves the ability of prior art error detection systems to detect systematic errors. *See* '662 patent at col. 2, ll. 51–53.

This claimed technological improvement is akin to the type of non-abstract improvement we found to be patent-eligible in *Finjan*. In *Finjan*, the claims at issue recited a method of providing computer security by generating a "security profile" that identifies suspicious code that performs "potentially hostile operations." 879 F.3d at 1303–04. Unlike traditional systems that "simply look[ed] for the presence of *known* viruses," the claimed method was able to identify "*potentially* dangerous or unwanted operations. *Id.* at 1304 (emphases added). Thus, we concluded that the claimed method was directed to a "non-abstract improvement" over the prior art because it employed "a new kind of file that enable[d] a computer security system to do things it could not do before." *Id.* at 1305. Here, as in *Finjan*, the claimed invention is also directed to a non-abstract improvement because it employs a new way of generating check data that enables the detection of persistent systematic errors in data transmissions that prior art systems were previously not equipped to detect.

Appellees argue that the claims are ineligible because they fail to recite a last application step that uses the generated check data to actually perform error detection. According to Appellees, without this last step tying the claims to a "concrete application," the claims are doomed to abstraction. Appellees' Br. at 18–21. We disagree.

A claim that is directed to improving the functionality of one tool (e.g., error checking device) that is part of an

existing system (e.g., data transmission error detection system) does not necessarily need to recite how that tool is applied in the overall system (e.g., perform error detection) in order to constitute a technological improvement that is patent-eligible. Rather, to determine whether the claims here are non-abstract, the more relevant inquiry is "whether the claims in th[is] patent[ ] focus on a specific means or method that improves the relevant technology or are instead directed to a result or effect that itself is the abstract idea and merely invoke processes and machinery." *McRO*, 837 F.3d at 1314; *cf. Electric Power Group, LLC v. Alstom S.A.*, 830 F.3d 1350, 1354 (Fed. Cir. 2016) (finding claims to be directed to a patent-ineligible abstract idea because "the focus of the claims [wa]s not on such an improvement in computers as tools, but on certain independently abstract ideas that use computers as tools").

In the present case, the appealed claims recite a sufficiently specific implementation (i.e., modifying the permutation applied to the original data "in time") of an existing tool (i.e., check data generating device) that improves the functioning of the overall technological process of detecting systematic errors in data transmissions. *See McRO*, 837 F.3d at 1313–16; *Ancora*, 908 F.3d at 1348–49. Importantly, the claims do not simply recite, without more, the mere desired result of catching previously undetectable systematic errors, but rather recite a specific solution for accomplishing that goal—i.e., by varying the way check data is generated by modifying the permutation applied to different data blocks. *Id.* at 1349; *Finjan*, 879 F.3d at 1305–06; *SAP America Inc. v. InvestPic, LLC*, 898 F.3d 1161, 1167 (Fed. Cir. 2018). In so doing, the claims sufficiently capture the inventors' asserted technical contribution to the prior art by reciting how the solution specifically improves the function of prior art error detection systems.

Importantly, Appellees do not dispute that varying the way check data is generated provides an improvement to an existing technological process. Rather, their main

argument is that this improvement is not adequately captured *in the claims* because the claims fail to tie the permutated data with the generation of new check data. Oral Arg. at 23:02–32; Appellees' Br. at 29–34. We disagree.

The appealed claims require that a "varying device" be configured to "vary original data *prior to supplying said original data to the generating device as varied data*," and that the "generating device" be configured to "generate check data." '662 patent at claim 1 (emphasis added). In a "wherein" clause, claim 1 specifies how the original data is varied by the varying device: by including a "permutating device configured to perform a permutation" on the bits in each block making up "said original data." *Id.* Thus, contrary to Appellees' proposed reading, claim 1 logically requires that original data be varied by permutation before being supplied to the generating device as "varied data."

Appellees further contend that even if the claims connect the permutated data with the generation of check data, the appealed claims are not directed to a patent-eligible technological improvement because the specification does not mention any technological benefit of using *permutations* to generate check data.[2] But, even assuming that the law required the specification to discuss a technological benefit of the purported invention, as Appellees suggest, Appellees' argument still fails because it does not account for the specification as a whole. The specification states that "a variable checking function," as opposed to a "normal (fixed) checking function," "can almost always prevent the non-detection of repetitive errors." '662 patent at col. 2, ll.

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[2] Though Appellees contend that KPN waived its argument that the specification discusses the technological benefits of the dependent limitations of claims 2–4, Appellees' Br. at 35, we believe that it was adequately preserved in KPN's Opposition Brief to Defendant's 12(c) motion. *See* J.A. 428–49, 438.

48–53. In a later section, it states that one way of providing a "variation value" is to use "different permutations." *Id.* at col. 5, l. 65 – col. 6, l. 2. Thus, a review of the specification makes clear that modifying the permutation in time provides the technological benefit of preventing non-detection of repetitive errors, just like other variable generating functions.

Appellees contend that the district court correctly found that the claims on appeal are similar to the abstract "data manipulation" claims that we have held to be ineligible in prior cases. Appellees' Br. at 27–29. We disagree. While the claims in those cases were arguably related to advances in computer technology, none were limited to a specific improvement in computer functionality. Absent sufficient recitation of *how* the purported invention improved the functionality of a computer, the "improvement" captured by those claims was recited at such a level of result-oriented generality that those claims amounted to a mere implementation of an abstract idea on a computer, not the specific way to improve the functionality of a computer. *See Electric Power Group, LLC v. Alstom S.A.*, 830 F.3d 1350, 1354 (Fed. Cir. 2016). While the patents in these cases may have claimed an improved result in a technical field, the claims failed to recite a specific enough solution to make the asserted technological improvement concrete.

For example, in *Digitech*, the patented invention purportedly solved the problem of distortion that occurred when translating the display of an image from a source device to a different output device. 758 F.3d at 1347–48. The claimed solution took various device-dependent information and "combin[ed]" them into a "device profile." *Id.* at 1351. Though the specification discussed using this device profile to correct for device-specific image distortions, *id.* at 1347–48, this asserted improvement in image processing was not specifically captured in the claims. In the

preamble, the claimed method stated that the "device profile" was used "for capturing, transforming, or rendering an image." *Id.* at 1351. But in the body, the claimed method failed to explain how the device-dependent information was actually used by the recited mathematical correlation to accomplish image distortion correction. *Id.* at 1350–51. Absent further elaboration, the claims were too abstract to capture the inventors' purported technical contribution in correcting image distortion. As such, the claims amounted to no more than "taking existing information . . . and organizing this information into a new form." *Id.* at 1351.

In *RecogniCorp*, the inventors purported to solve the problem of encoding images in a way that required "less memory and bandwidth." 855 F.3d at 1324. While the claims used an "image code" to reproduce an image based on a mathematical operation, *id.*, they did not adequately capture the inventors' asserted technical contribution, because the claims recited no more than "*standard* encoding and decoding, an abstract concept long utilized to transmit information." *Id.* at 1326 (emphasis added). Thus, we found that the claims merely amounted to an ineligible abstract process "for which computers are invoked merely as a tool," not a software invention that actually improved the functioning of a computer. *Id.* at 1327 (emphasis added) (quoting *Enfish*, 822 F.3d at 1336).

The ineligible claims in *Two-Way Media* and *Intellectual Ventures*, which are even less similar to the appealed claims, also fail to concretely capture any improvement in computer functionality. In *Two-Way Media*, we found that the claimed solution merely recited a series of abstract steps ("converting," "routing," "controlling," "monitoring," and "accumulating records") using "result-based functional language" without describing how the goal of real-time load balancing was achieved. 874 F.3d at 1337. In *Intellectual Ventures*, the asserted technological improvement appeared to be accomplished by a user interacting with a

generic user interface, and the claims recited nothing that "improve[d] the functions of the computers itself" or "provide[d] specific programming, tailored software," or other "meaningful guidance." 850 F.3d at 1339–42.

Like the ineligible claims discussed above, the appealed claims also process data (by reordering information via permutation). However, because these claims specifically recite how this permutation is used (i.e., modifying the permutation applied to different data blocks), and this specific implementation is a key insight to enabling prior art error detection systems to catch previously undetectable systematic errors, '662 patent at col. 2, ll. 48–53, we conclude that the appealed claims are not directed to an abstract idea because they sufficiently capture the specific asserted improvement in detecting systematic errors contributed by the inventors of the '662 patent.

Having decided that all claims on appeal are not directed to an abstract idea at step one of *Alice*, we need not proceed to a step two analysis. *Visual Memory*, 867 F.3d at 1262.

CONCLUSION

For the foregoing reasons, we hold that claims 2–4 are not directed to an abstract idea at step one of *Alice*. We have considered Appellees' remaining arguments and find them unpersuasive. Accordingly, we reverse the district court's grant of Appellees' Rule 12(c) motion finding that claims 2–4 are ineligible on the pleadings.

REVERSED